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The

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Telephone Development.

ON Thursday last week a deputation from the Telephone Development Association waited on the Postmaster-General, Sir William Mitchell-Thomson, with a view to pressing on the attention of the Government the importance of pursuing an active policy of development of the telephone service in this country. Sir Alexander Roger, chairman of the Association and of the Automatic Telephone Manufacturing Co., introduced the deputation, and suggested to the Postmaster-General that in the telephone business, above all, it was necessary to take a long view and adopt a fixed policy; the probability that the present Government would enjoy a long term of office offered an ideal opportunity to work on these lines, with immense advantage both to the public in general and to the workers who were in need of employment.

Mr. Hugo Hirst, supporting the proposal, pointed out that British telephone manufacturers had supplanted the Germans in supplying foreign markets, and that their factories already employed over 100,000 hands; as many more could be set at work if the programme for the next few years were definitely known.

In his reply the Postmaster-General admitted that the British public had not yet acquired the "telephone habit," and needed education in the matter. During the past four years £30,000,000 had been spent on the telephone service, and the State was bound to provide the necessary funds for its maintenance and extension.

Sir William expressed himself as in sympathy with the objects of the deputation, and suggested that the Association should devote special attention to increasing the calling rate—*i.e.*, the load factor—of the existing telephones; that, of course, must be one of its aims, for the more the telephones are used, the more telephones will be installed, and *vice-versa*. The question arises how these objects can be attained.

The Postmaster-General undertook that the Post Office would do its best to meet all demands for telephone

service, and in that expression he unconsciously epitomised the policy of the Department and explained why the telephone service has failed to attain the proportions that should prevail in an industrial country such as this. It is the same attitude that we have often observed and do observe to-day in the management of many electricity supply undertakings. If the public wants the service, it shall be provided, with pleasure—but the public must come and ask for it. Can any business be run successfully on these lines? To what do we attribute the development and prosperity of the great retail stores, for example; did they open a shop in a back street and wait for the public to apply for service?

The key that opens the way to success is *publicity*. First, one must have a good thing to sell; secondly, one must not wait for customers: one must create a demand, and keep on creating new demands. The Post Office, like the electricity supply undertakers, has an excellent thing to sell—a valuable service, which can be furnished by no other agency. All those who know the merits of that service, and know that they need it, know also how to get it, but the great, sleepy, conservative-minded public knows none of these things. It must be educated, as Sir William said. No blame attaches to him, of course, for past shortcomings; he sees the remedy for the disease, and we hope he will insist on its adoption. No half measures will serve—the Post Office Telephone Service must advertise itself systematically and under expert guidance, and must not be afraid of the cost. A business which is developing at the rate of 7½ millions sterling a year must expect to expend advantageously at least £100,000 a year on its publicity service; we doubt whether the Post Office has ever so spent one-tenth of that amount. At present no effort is made to induce people to install telephones. The new Postmaster-General sees what is wrong, and he has a unique opportunity to prove himself a real director and not a mere figurehead; we hope he will take hold of the reins with a firm hand and do his own driving.

More About Argentina.

Those who are interested in the trade situation in Argentina, to which we made reference last week in discussing the forthcoming visit of the Prince of Wales, will find it profitable to study the annual report by Mr. H. O. Chalkley, H.M. Commercial Secretary in Buenos Aires, which has since been issued. It is felt that the immediate outlook is more favourable than that of any other time since the year 1920, and that the prevailing spirit is one of optimism in spite of many handicaps. That the difficulties of the situation are great is unquestionable, but it is not considered that these can outweigh the advantages of national resources, geographical position, and human enterprise which will enable the vast programme of public works to be undertaken. This programme includes land settlement, roads, railways, irrigation, power schemes, port works, and what the *Board of Trade Journal* describes as "decongestion of Buenos Aires."

It is anticipated that in 1925 there will be an increased demand for goods which the United Kingdom can supply, but it is guardedly added: "whether that demand will be transformed into larger orders for British goods, or whether it will be neutralised by intensified competition from Germany, following the adoption of the Dawes Report, cannot yet be seen." A Treaty of Commerce was signed just one hundred years ago between the United Provinces of the River Plate and "His Britannic Majesty," and the chief lesson drawn from that century of experience is that the surest and soundest basis for the expansion of British trade is the foreign investment of British capital and the settlement abroad of British traders. The visit of the Prince of Wales should do much to secure continued progress along these lines.

The complete report by Mr. Chalkley will be reviewed later, but from the Board of Trade advance reference to it we learn that in spite of the growth of the Argentine market for electrical machinery and material, conditions have not helped to increase the British share, owing to German competition. He says that the chief reason for this is price, insulated wires and cables being cited as a class of goods for which German makers have been able to underquote others; but it is not price alone which operates to the German advantage, for there is the important point which was so frequently discussed here as long as ten years ago, namely, the German ownership of most of the electricity supply undertakings. Further, there is an absence of modern wiring regulations in the Argentine, which means a low standard of work and cheap materials. There is also the existence of large well-known local branches of German electrical manufacturers, where stocks are carried and where technical service is given; and notwithstanding anything that may happen in Germany, there is the Teutonic willingness to grant extended credit terms. The British manufacturers have ther best chance where enterprises are British-owned and Mr. Chalkley's advice includes counsel to do everything possible to cultivate this class of connection. Financiers and investors may increase the possibilities for our electrical traders by finding British capital for the important new enterprises which are included in the present programme of public developments.

British Enterprise in the Baltic Republics.

Sir Philip Dawson, M.P., who has recently paid a business visit to Esthonia and Latvia in company with Mr. P. J. Hannon, M.P., the chairman of the Industrial Group of the House of Commons, addressed the London Chamber of Commerce last week upon the great importance of these two Baltic Republics to British traders and industrialists. They are of importance first because of their agricultural resources, their timber and flax production, and their very large oil shale deposits, but they also mean much to us because the ports of Riga and Reval provide Western Europe with the means of communication with Russia. The latter consideration must not be lost sight of because, however difficult trade with Russia may be at the moment, it will mean far more to us in the future. Sir Philip, in referring to the immense value of the Esthonian oil deposits—he said that they were worth thousands of millions of pounds—remarked that German commercial penetration was even greater than before the war, but arrangements had been made with a German firm under which we shall benefit by its experience and shall also secure that any development which takes place in the shale oil industry will be carried out with plant manufactured in this country. The speaker also alluded to the great water power development that will take place in Latvia by the canalisation of the Dwina River and its linking-up with the Dnieper, a scheme which will mean the provision of an additional 200,000 h.p. for industrial purposes. The meeting, by resolution, expressed its view that everything possible should be done to foster trade between Britain and the two Republics.

The Netherland East Indies.

The report of Mr. H. A. N. Bluett, Commercial Agent at Batavia, Java, which is reviewed elsewhere in this issue, reminds us that the market represented by the Dutch East Indies is an important one from the British point of view. The share of our Empire in the export trade of these islands was almost 40 per cent. of the whole, about half of this being credited to Great Britain itself.

For the last year or two the Government, in common with most others, has experienced a period of severe financial stringency. This has led to the curtailment of the numerous activities which this enlightened Government has pursued. Now, however, there is an immediate prospect of equilibrium in the Budget, and there is reason to believe that such matters as railway

electrification and other engineering projects will be actively undertaken. At the same time, the water power of the Mamasa River in the Celebes is being considered as a source of hydro-electricity. The harnessing of this potent watercourse will involve the expenditure of a large sum of money (30 million guilders, or approximately 2½ millions sterling). An effort is being made to raise this sum to enable the falls to be utilised for generating electricity in conjunction with an electro-chemical undertaking.

Mr. Bluett's report does not appear to hold out much hope for newcomers to the engineering market, as all the best-known manufacturers of the principal European countries, as well as the United States, are already well represented. Competition is said to be keen, but it is satisfactory to learn that Germany is now not so active a competitor, and that British prices are more in conformity with Continental offers without any sacrifice of quality.

E.T.U. Strike Threats.

THE latest squabble in the electricity supply industry is in the West—at the power station of the Brompton and Kensington Electricity Supply Co. It appears that two members of the Electrical Trades Union are in arrears with their subscriptions, and in order to collect these, or, alternatively, to "pay the men out," the E.T.U. secretary has called upon the company to dismiss the alleged "defaulters." Naturally, the company refused to become the collector for the Union, though it has no objection to employing trade unionists—on the contrary, it prefers that its employés should be members of a union. Strike notices were therefore served on it, to expire on Tuesday afternoon. But the company, which had had no dispute with its employés for 35 years, announced that it could and would maintain the supply of electricity in any event, and would not be able to reinstate those who ceased work.

Of the ability of the company to carry on we have no doubt; but, writing before the specified date, we very much doubt whether any strike will take place. A meeting of shop stewards was to be held on Monday to consider, it was rumoured, the question of extending the threatened strike to all the London power stations, but the subject is trivial in the last degree, and we can hardly believe that the members of the union who are concerned will follow their leaders into the wilderness. Our readers, no doubt, are as tired as we are of these recurring "alarums and excursions" which amount to nothing. On previous occasions it has been amply proved that the London Executive cannot control its members; we think, on the other hand, it is high time that the members controlled their executive. It is like a child that has gained possession of a hammer, with which it would destroy the happy home—but, fortunately, it is not strong enough to wield it. Until the London Executive has learnt to control itself, it is not likely to be able to control others.

Foreign Radio Material.

ON January 1st, the new broadcasting receiving licences will come into use, and the condition attached to the existing licences that the holders shall not (knowingly) use foreign-made sets or components will cease to operate. The possible effect of the removal of this embargo has been the subject of much comment in the daily Press, and conflicting opinions have been expressed. Whether the condition has affected trade materially is open to question, for the amateur purchaser is unable to discriminate between British and foreign components, and probably there has been a good market for the latter in the cheaper lines. The expert, knowing that the British products are of superior quality, and realising the importance of high quality in his apparatus, has, no doubt, taken care to avoid foreign goods, and will continue to do so.

One factor which will tend to hinder foreign competition is the increasing interest in broadcasting which is being manifested on the Continent; this will result in the local absorption of a large proportion of the output. The Safeguarding of Industries duty has also had some influence in mitigating the severity of foreign competition, but even a duty of 33⅓ per cent. on certain items is insufficient to keep them off the market. The radio manufacturers of this country, who are said to number no fewer than 1,700, are under agreement with the B.B.C. to use no components or materials of foreign manufacture. Perhaps the most vulnerable section of the industry is that which manufactures headphones, the only item of the crystal-user's outfit which he cannot make for himself. Many thousands of foreign headphones have been sold at extraordinarily low prices in this country; the instruments are of poor quality in comparison with our own products, and probably are often replaced by the latter when the purchaser discovers their inefficiency. We may surmise that the question whether an instrument is British is put to the seller only by those whose patriotism and sense of moral obligation impels them to do this, and that purchasers of this class will continue to discriminate in favour of home-manufactured goods, clause or no clause. As regards complete valve sets, importers will have to take account of the patents owned by the Marconi company, which cover most of the sets made in this country.

Should it be found that the wireless industry is seriously affected by the removal of the embargo, no doubt it will be able to make out a good case for the application of the Safeguarding of Industries Act. One manufacturer who employs 1,000 persons on radio apparatus alone, has informed the *Morning Post* that the admission of foreign-made goods will have a terrible effect on the British industry, and other prominent manufacturers have prophesied disaster; but, on the other hand, there are those who declare that Germany is technically far behind this country, and that there is no occasion for alarm. As for the United States, the practice in vogue there differs materially from British methods, and the American market is so lively that there is not likely to be a large surplus of production for export.

Perhaps the most reassuring feature of the situation is the fact that our technique is at least as far advanced as that of any of our possible competitors, and that the scope for improvement, development, and research in radio technology is so wide that we may hope to retain our internal trade by technical merit.

What of 1925?

ON another page of this issue we make mention of a forecast of what 1925 may mean to the electrical industry of the United States. It is an essay in optimism, and the principal reason advanced for such a happy view is that the result of the recent presidential election has given both makers and buyers a feeling of security inclining them to embark with some certainty of success on all manner of enterprises. This is not intended to apply merely to industrial enterprise; the ordinary individual may be undertaking an enterprise when he purchases a washing machine or fire. He certainly will not do this if he thinks that conditions make his job insecure, but this stability encourages him to make the purchase.

In Great Britain, too, the recent General Election has given us a Government with every prospect of a long life, and we may expect, therefore, that the situation here will be somewhat the same as in the United States. We cannot hope to progress at the same rate, of course; the war is still more than a memory to us, but we can display a feeling of confidence that will assist the revival of our depressed industries.

In proportion, our uncultivated electrical field is greater than that of the United States: the possibilities are enormous. The ensuing year must be one of education and development, the facilities for the obtaining of electrical service following closely upon the inculcation of the electrical idea.

Manufacturers, dealers, and supply authorities must act in concert to make 1925 an electrical year; the business is available, but the customers must be *made*.

Boiler-Room Practice.

Balancing Boiler-Room Heat.

By JOHN BRUCE, A.M.I.E.E.

SCIENTIFIC boiler-room operation in the case of the large modern electricity generating station is becoming more and more a matter of a continual series of tests. The duration of the test periods, at the end of which the performance of the plant is expressed in the form of efficiencies and losses, may vary from one week to, in a few prominent cases, twenty-four hours. In fact, an attempt is now being made to check the performance, as far as the information derived from instruments will permit, at the end of each eight-hour shift.

The successful development during the course of the last few years of scientific instruments for boiler-room control has enabled such instruments to be widely adopted for use in everyday operating practice, and from the interpretation of the information given by reliable instruments, supplemented by the experience of correctly interpreting observable conditions, the problem of the boiler-room engineer of to-day is greatly simplified. Marked developments have also taken place in the boiler-room *personnel*. With the progress made in metering practice, brawn and muscle have given place to intelligence and ordinary common sense, and no longer do the operating force look upon the boiler-room instrument equipment as a display of scientific toys, for they realise that with the greater information at hand it is possible, not only to keep the plant operating under the usual approximate conditions, but to maintain the operation week in, week out, at maximum economy.

By means of a system of continual testing, a continuous check can be kept upon the heat losses taking place in each component part of the boiler-room equipment. As enlarged upon and discussed in previous articles, the principal items of these heat losses are the various excess air components, unburned gases, high final flue gas temperatures, and unburned coal discharged to the ash-pit. The success of a system for continual boiler plant testing necessitates much more than the mere tabulation of instrument indications, meter integrations, and the calculation of certain values by rule-of-thumb formulæ of the meaning and evolution of which the engineer may have no conception.

The proper relation existing between the various losses must be determined so that none will be reduced to such an extent as to increase unduly the values of others for, as was pointed out in a previous article, boiler-room heat losses are all more or less interdependent. From an analysis of the losses and the correct interpretation of their relationship to each other, it should be possible so to maintain the everyday operating conditions that the *total* losses will be a minimum. A careful study, over a period, of the losses involved in daily operation is the best possible method of determining, under conditions of commercial operation, the effects of different operating methods, and the behaviour and performance of the various components of coal-consuming and steam generating equipment. Further, such a study permits the ready estimation of such savings as may be due to soot-blowers, automatic regulators and controls, and boiler-room auxiliary plant in general. For during official or extraordinary tests the factors influencing the efficiency of the unit, introduced by such auxiliary appliances, may be too small to determine individually.

In the tabulation of a heat-balance report, the operating results for the day should show each loss reported as a separate item, and where a highly-organised test department is responsible for generating station technical operating data, it should be possible to present a report giving the operating results of each shift. Instead of tabulating the results only in percentages and B.th.u. an effort should be made to report the day's, or other period's, operation in terms of pounds, shillings and pence, so that every man on the job will realise the effect of carelessly using equipment that has been purposely installed to save coal, but which in itself is helpless unless correct and intelligent methods are applied in its operation. Therefore, if efficiency, consistent with reliability and money-saving, is the aim of the boiler-room engineer-in-charge, the surest road to such an end is to determine, daily if possible, the magnitude of the different losses, make an analysis of their relationship, and keep their *total* at a minimum.

Present-day industrial conditions, the problem of coal conservation, and the increasing general economic pressure, have produced a demand for greater economy in the operation of power station generating plant and interested the engineer in greater detail in the matter of plant performance, and approximate determinations are no longer satisfactory. The progress in methods of boiler-room operation has made the determination of the heat losses simple and precise, and it is in this matter of increased precision that opportunities for increased economy are less liable to be overlooked.

Heat losses involved in the operation of boiler-room plant are, for the most part, computed from certain standard formulæ forming part of technical institution or society boiler-test codes, and in many cases the formulæ offered are of doubtful accuracy. The use of the latter has, with many engineers, become a matter of second nature, and the best that can be said for the majority of doubtful formulæ offered for combustion calculations is that they are at least approximations of equal accuracy to any other rule-of-thumb measurements. The foregoing remarks apply particularly to certain widely-used formulæ for actual combustion and flue gas calculations and, to repeat what has been emphasised in previous articles, such calculations can only be computed to an acceptable degree of accuracy from an analysis of the coal delivered to the furnaces and an analysis of the resultant gaseous products of combustion. In fact, a full and careful study of combustion phenomena and the actions and reactions involved in the combustion of the constituents of coal will well repay the aspiring engineer, and will place before his mind's eye a clear and lucid picture of the process of liberation, distribution, and destination of the heat units generated in the furnace.

Many engineers are under the common impression that a test, or a system for the continuous testing of boiler plant, involves a chaos of instrument equipment and the necessity for such an amount of detailed mathematical calculations that only for special occasions can such ceremonies be contemplated. The larger generating stations, however, now have some form of system which can be placed under the common term of "continuous testing," by means of which the various efficiencies can be determined and the various losses estimated, separated, and apportioned at least every twenty-four hours. The tabulation of boiler-room operating results necessitates calculations which, though simple, are rather involved as usually applied and incur considerable time and effort. In the majority of instances, however, the work can be greatly simplified by the use of charts, graphs, and tables, and only a small amount of time is necessary to fully report operating results.

Though the necessity for accuracy and detail has been stressed in the foregoing paragraphs, there are many boiler plants, especially in the smaller generating stations where, in consequence of the lack of instruments and other metering apparatus, it is impossible to determine and separately evaluate the various items of a detailed heat balance report. In such cases approxima-

tions are the best that can be expected, but there is no reason why such approximations should not be deduced from accurate standards and conform to some sort of system. Even if the instrument equipment of a boiler plant consists of only a pyrometer for the measurement of final flue gas temperature, and a CO_2 indicator or recorder for the determination of the CO_2 content of the waste gases discharged to the stack, it is possible, from a periodic analysis of the coal supplied, to determine a set of standard data from which the overall efficiency of the plant can be reasonably estimated.

In the smaller plants the quality, class, and composition of the coal consumed does not, as a general rule, vary between very wide limits, and if periodically an ultimate analysis is made of a representative sample, sufficient data can be computed from the information obtained, against which the performance of the plant can be compared at any instant. Further, the final form of such data provides the operating crew with a definite something to strive for, or, in effective American parlance, it gives them "something to shoot at." Boiler plant efficiencies are, as a rule, calculated from measurements of weight of coal consumed and weight and heat content of steam produced or water evaporated. In the smaller plants these values are rarely determined and, briefly, the method to be described, which is applicable to the small plant that at least has a flue gas pyrometer and CO_2 recorder, ignores the measurement of coal and steam or water weights, and consists of the estimation of the combustion losses involved. These combustion losses are determined from the values given by the periodic ultimate analysis, and if properly collected, the weight of combustible determined, and the average loss from this source found to be 1 per cent. of the total coal consumed. Also assume that a series of "still" tests have been made on the separate boiler units or on the total boiler plant, and that the coal required to make good the commonly termed "radiation" loss for the complete plant represents 5 per cent. of the total coal consumed at full or normal load. A "still" test means the determination of the weight of coal consumed, necessary to maintain full working pressure on the boiler unit or plant, but supplying no steam for commercial load. Both the foregoing tests are simple to carry out, require very little in the way of laboratory or boiler-room instrument equipment, and provide a check on two sources that can produce serious operating losses. "Still" tests (or in cases where, from water evaporated and coal consumed, a "Parsons line" can be obtained for the complete plant or single boiler unit) provide valuable information concerning the minimum figure at which banking losses can be maintained. Coal required for banking and lighting-up is, to a certain extent, governed by the load factor, but provided that accurate information is obtained by either of the above methods, it is a simple matter to determine a minimum figure as a standard for banking and lighting-up losses consistent with a predetermined factor of reliability.

To return to the analysis of the coal. Calculated from the data obtained and the combined weights of the elements involved, the products of perfect combustion and the distribution of the elements in the coal will be as shown in Table I.

TABLE I.—PRODUCTS OF PERFECT COMBUSTION AND DISTRIBUTION OF ELEMENTS INVOLVED.

Chemical Symbol.	Elements in Coal. lb. per lb.	Distribution of Elements. To Ash Pit.	To Gas Passes and Stack.	O_2 and Air Utilized for Combustion. lbs. O_2	Air.	Products of Perfect Combustion. lb. per lb. of Coal. CO_2	O_2	N_2	H_2O	SO_2
C	·700	·010	·69	1·835	7·927	2·525	...	6·092	...	...
H_2	·045	...	·045	·360	1·555	...	...	1·195	·405	...
O_2	·035	...	·035	...	...	...	·035	...	...	...
N_2	·010	...	·010	...	...	...	...	·010	...	...
S	·010	...	·010	·010	·043	...	...	·033	...	·02
Ash	·100	·100	...	...	...	...	...	...	...	...
Moisture	·100	...	·100	...	...	...	...	...	·100	...
Total	1·000	·110	·890	2·205	9·525	2·525	·035	7·330	·505	·02
Less O_2 in Coal and equivalent Air and N_2				·035	·151	...	·035	·116	...	...
			Totals:—	2·170	9·374	2·525	...	7·214	·505	·02

totalled, together with the "radiation" loss and the loss due to unconsumed carbon carried over in the ash, must obviously represent the total losses incurred in the operation of the plant. The following example, worked out in detail, will clearly explain the various necessary steps in the institution of such a system.

We will assume that the coal consumed has been regularly and systematically sampled during a period of one month's operation, and on analysis the following values for the composition of the coal have been obtained:—

ANALYSIS OF COAL AS FIRED.

Carbon = C	=	70.00 per cent.
Hydrogen = H_2	=	4.50 ,, ,,
Oxygen = O_2	=	3.50 ,, ,,
Nitrogen = N_2	=	1.00 ,, ,,
Sulphur = S	=	1.00 ,, ,,
Absolute ash	=	10.00 ,, ,,
Moisture	=	10.00 ,, ,,

Gross calorific value, B.th.u. per lb. as fired = 11,000.

We will further assume that during the month's operation, samples of the ashes discharged have been

Assuming that complete combustion of the hydrocarbon constituents is obtained, the next step is the calculation of the weight of the products of combustion with different percentages of excess air. The theoretical air required is, as we have seen from Table I, 9.374 lb. per lb. of coal, therefore each increment of 20.0 per cent. excess air will mean the addition of 1.875 lb. of air. Each increase in air quantity means the addition of excess O_2 and N_2 to the products in Table I, and for every 20.0 per cent. increment of excess air there will appear in the products of combustion the values shown in Table II.

It will be noted that the weight of H_2O produced by the combustion of the hydrogen and the evaporation of the moisture content of the coal is constant throughout. Therefore, the value of the combustion loss due to heat carried away by the H_2O content of the flue gases is dependent only on initial and final temperatures, and is unaffected by the percentage of excess air with which the fuel has been consumed.

Volumetric gas analysis is on a basis of dry flue gases, and the next step in the computations is the conversion

TABLE II.

Chemical Symbol.	Weight of Products of Perfect Combustion.	Weight of Products of Combustion, with varying percentages of Excess Air. 20%	40%	60%	80%	100%	120%	140%	160%	180%	200%
CO_2	2·525	2·525	2·525	2·525	2·525	2·525	2·525	2·525	2·525	2·525	2·525
O_2	...	·434	·868	1·302	1·736	2·170	2·604	3·038	3·472	3·906	4·340
N_2	7·214	8·655	10·096	11·537	12·978	14·419	15·860	17·301	18·742	20·183	21·624
H_2O	·505	·505	·505	·505	·505	·505	·505	·505	·505	·505	·505
SO_2	·020	·020	·020	·020	·020	·020	·020	·020	·020	·020	·020
Totals	10·264	12·139	14·014	15·889	17·764	19·639	21·514	23·389	25·264	27·139	29·041

Table III.—Weight of Dry Products of Combustion.

Chemical Symbol.	Weight of Dry Products of Perfect Combustion. lbs.	Weight of Dry Products of Combustion with varying percentages of Excess Air, lbs.									
		20%	40%	60%	80%	100%	120%	140%	160%	180%	200%
CO_2	2·525	2·525	2·525	2·525	2·525	2·525	2·525	2·525	2·525	2·525	2·525
O_2	...	·434	·868	1·302	1·736	2·170	2·604	3·038	3·472	3·906	4·340
N_2	7·214	8·655	10·096	11·537	12·978	14·419	15·860	17·301	18·742	20·183	21·624
Total	9·739	11·614	13·489	15·364	17·239	19·114	20·989	22·864	24·739	26·614	28·489

Table IV.—Percentage Weight Dry Products of Combustion.

Chemical Symbol.	Percentage Weight of Dry Products of Perfect Combustion.	Percentage Weight of Products of Combustion with varying percentages of Excess Air.									
		20%	40%	60%	80%	100%	120%	140%	160%	180%	200%
CO_2	25·926	21·74	18·72	16·43	14·65	13·21	12·03	11·04	10·21	9·49	8·86
O_2	...	3·74	6·43	8·47	10·07	11·35	12·41	13·29	14·03	14·67	15·24
N_2	74·074	74·52	74·85	75·10	75·28	75·44	75·56	75·67	75·76	75·84	75·90

Table V.—Percentage Volume Dry Products of Combustion.

Chemical Symbol.	Percentage Volume, Dry Products of Perfect Combustion.	Percentage Volume Dry Products of Combustion with varying percentage of Excess Air.									
		20%	40%	60%	80%	100%	120%	140%	160%	180%	200%
CO_2	18·2	15·1	12·9	11·3	10·0	8·9	8·1	7·4	6·8	6·3	5·9
O_2	...	3·5	6·1	7·9	9·4	10·6	11·5	12·3	13·0	13·6	14·1
N_2	81·8	81·4	81·0	80·8	80·6	80·5	80·4	80·3	80·2	80·1	80·0

of the weight of dry products of combustion to a basis of percentage volume. The results for the coal in question, showing the successive steps in the tabulation of the different values, are set out in the accompanying Tables III, IV, and V.

(To be continued.)

New Year Resolutions for the Electrical Trade.

Collected by T. J. B.

It is the custom of the daily Press to publish, on the eve of a new year, a few words of cheer, advice and prophecy from public men. In order that readers of this journal may have the benefit of similar words of wisdom, the writer has obtained from mythical representatives of the electrical trade a number of good resolutions which will be made with due solemnity on the night of December 31st. Let us not suppose that they will all be kept, for did not a wise man say something to this effect?—

> Indeed, indeed, Repentance oft before
> I swore, but was I sober when I swore?
> And then and then came Gain, and Cash-in-hand,
> My thread-bare Penitence apieces tore.

The writer first interviewed *a Contractor* who, having been warned that anything he might say would be used in evidence against him, declared: "I will use only first grade British material in all installations, and will employ fully competent workmen who shall be encouraged to make as little noise and dirt as possible when wiring inhabited houses, even if it takes a little longer to do the work quietly. When customers ask for my advice, I will recommend apparatus which will give them maximum satisfaction, rather than that which will give me maximum profit.

"If my trade in wireless apparatus dwindles through the competition of the local stationer, I will not revile those who give him trade discounts, but by giving better service will obtain all the local custom and drive the stationer back to his pens, ink and paper.

"Cobblers' children may be ill-shod, but my children shall grow up among modern lighting fittings, electric fires, and other choice goods from my show-room."

A 50-watt halo is being sent to this gentleman, free of all charges.

A Wireman, met casually outside a filling station, said: "I'm going to do good work next year, no scamped jobs with fittings pulling out of the walls in a few weeks, bad joints and such like. And if the Boss tells me to forget the conduit under floors where it won't show, I shall look for another job, I shall. Thank you sir, it is dry work, with the plaster getting in your throat."

A Manufacturer was too busy chasing orders to be interviewed, but as he flashed by handed the writer a slip, on which appeared: "Salesmen not to promise delivery dates which cannot be kept. Give a good job at a reasonable price, but do not try to get extra profit from regular customers, or the regularity of their custom ceases. When quoting against foreign competition, base profit on minus zero subtracted from nothing, and if possible reduce establishment figure." One hopes he caught that order.

A Buying Engineer promised to make more use of B.E.S.A. specifications, in preference to old specifications used by his firm since the days when no accepted standards existed. He agreed that temperature rise on full load gives a better indication of the suitability of apparatus to carry a given current than conformity with arbitrary current densities. "I will try," he said, "to consider with an open mind offers of plant not exactly in accordance with my inquiry, remembering that I am not Mahomet, far from it."

An Engineering Student, flushed with pleasure at having received, as a Christmas present, a fur lined slide-rule, said: "I will try not to be disheartened by failure to solve difficult problems, remembering that hundreds of students before me have solved the same problems. I will take courage from the proverb often quoted by the late S. P. Thompson, 'What one fool can do, another can.'"

There, gentlemen, is a fair selection. Take your choice, or make no resolutions, but at least beware of the easy philosophy that believes to-morrow is another day.

The Heating of Commutators.

A Practical Investigation.

By PERCY HUGGINS, Assoc.A.I.E.E.

THE investigation herein described was conducted by the writer with data collected over many years' experience to establish reliable means by which the heating of the general run of commutators could be quickly and accurately predetermined, and this resulting thesis seems to fill a little gap which is left in all text-books on direct-current machine design. The scope of that part of the investigations to which this article is confined, covers continuously rated ventilated type dynamos and motors ranging from 10 kW to 1,500 kW capacity at all voltages met with in practice. Figures on as many different makes of machines as possible were incorporated; altogether the design data and test sheets of about 200,000 machines were available, of which over 5,000 were selected for detailed tabulation of figures. These figures were tabulated at first in no prejudiced order, and then much time was devoted to determining in what manner they could be classified, together with a method of calculation which would give consistency between calculable and actual results. Throughout the investigation help was accorded by testing staffs to examine certain theories to which the test results were found to point.

The Sources and Calculation of Losses Occurring at Commutators.

The sources of loss at commutators were explored. Undue loss and temperature rise may be occasioned by obvious brush, brush-gear, and commutator troubles of a mechanical nature, and in this category the writer particularly wishes to include noisy running of the brushes. Screeching or chattering of brushes with its often destructive consequences seems liable to develop only with high-resistance brushes and brushes of inferior quality. It is the writer's opinion that the use of high-resistance brushes to assist commutation was an expedient proper to the days when interpole action was not fully understood, and that it is a fallacy to retain them for general use on 440/550-volt interpole machines manufactured to-day. A correctly designed interpole machine does not depend on high brush resistance to secure satisfactory commutation, and therefore the most satisfactory brush is the best brush mechanically, giving the smoothest and most silent running, and such a grade is always a brush of moderate or low resistance with good graphitic content. The writer has come across several cases where 440- to 550-volt machines of high speed or wide speed variation have been provided with brushes of fairly high resistance in view of the high reactance voltage of commutation which appertains to such machines, and commutation has been unsatisfactory. At first it was thought that the sparking was due to the high reactance voltage and that higher resistance brushes were required to assist commutation, but such were found to aggravate the conditions, while soft graphitic brushes of low contact resistance were found to produce absolutely the desired result, thus showing that it is the inferior lubricity of high-resistance brushes and not reactance voltage which can be the cause of so much trouble. Any such mechanical troubles should be remedied at all costs before a machine is passed out of the factory.

Observation was kept to ascertain whether any component of the total loss at commutators ever arose from electrical conditions of commutation, such as reactance voltage, field form, &c., but it is evident that with interpole machines proportioned in accordance with the best modern practice, there is nothing from this source to interfere with our figures, and so the total loss at a commutator is ascribed to current loss plus brush friction loss, calculated as follows:—

Current loss = (armature amperes) × (brush contact drop in volts of positive plus negative brushes).

Friction loss in watts = $A \times S \times P \times K \times 746/33{,}000$,

where A = brush contact area in square inches,

S = peripheral speed of commutator in feet per min.,

P = brush pressure in lb. per square inch,

K = friction coefficient of brushes.

It is the writer's experience that the loss constants stated by different brush manufacturers should not be accepted unreservedly. Tests were often repeated on commutators with brushes of different makes which appeared to be of equivalent grade and *gave the same temperature rise;* and yet the constants stated by the makers in respect of these brushes, and the total loss

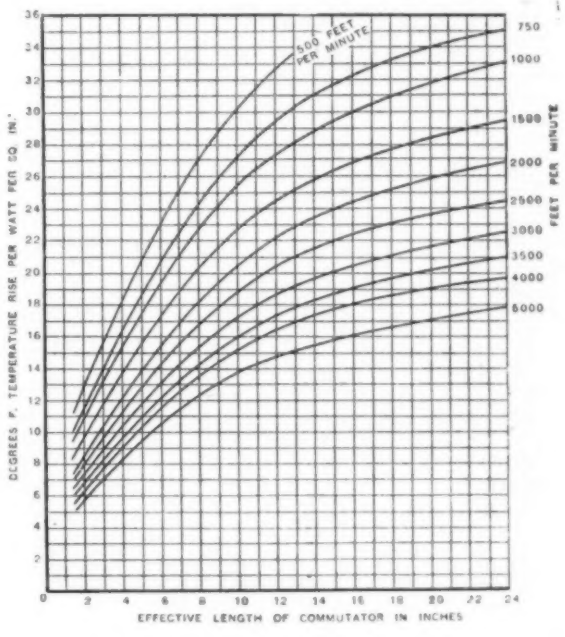


Fig. 1.—Relation of Commutator Length, Speed and Temperature Rise.

calculable therefrom, varied widely. It would appear that different manufacturers of brushes in their usage of disconnected and short-circuited commutators and other devices for testing the loss constants of their brushes, do not work under conditions which give exactly comparable results; and the writer has found it necessary in certain cases to work with constants adjusted as indicated by experiment on actual machines. Appended is a list of the chief grades of brushes, and against each is indicated the limits of the values used in the calculations mentioned here:—

Grade of brush.	Contact drop in volts positive plus negative brushes.	Friction coefficient.	Pressure on brushes, lb. per sq. in.
Specially hard carbon	2.5 to 3.5	.27 to .3	2
Medium graphite ...	1.8 to 2.2	.2 to .22	2
Soft graphite ...	1.8 to 2.2	.12 to .18	1½
Copper-graphite ...	.6 to 1.4	.18 to .22	2
Electro-graphitic ...	1.8 to 2.2	.2 to .24	2

Temperature Rise in Relation to Watt Loss.

It was confirmed that for practical design purposes it may be regarded that the temperature rise of a given commutator running at a given speed varies in direct

proportion to the total loss occurring at that commutator, and hence also to total loss at commutor/outside cylindrical area of commutator, which will be expressed in watts per square inch. Thus for a given commutator running at a given speed there will be a definite final temperature rise for every watt per square inch. This constant will be expressed in degrees Fahrenheit per watt per square inch, and therefore:—

Final temperature rise of commutator deg. F. = (watts /area in square inches) × deg. F. per watt per square inch.

The constant referred to was ascertained to vary considerably on different commutators, appearing to be almost entirely dependent on the peripheral speed and length of commutator in the following manner:—

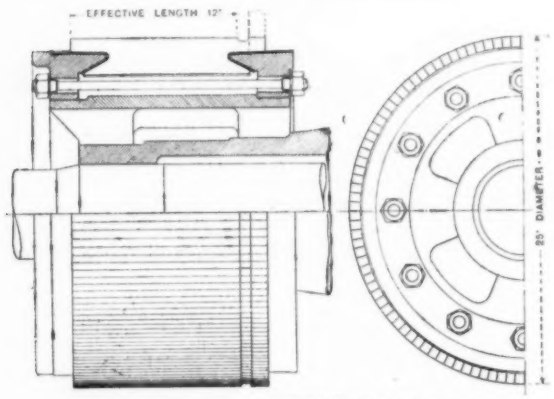


Fig. 2.—Commutator of a 700-kW, 460-V Generator.

Peripheral Speed.—The degrees F. per watt per square inch decreases with increase of peripheral speed. The convection of heat effected by rotation of the commutator is considerably in excess of any variation in convection produced by the varying amount of axial flow of air through machines, found on different machines within the types under consideration.

Length of Commutator.—The degrees F. per watt per square inch increases with increased length of commutator. It must be remembered that a quantity of heat leaves the commutator by conduction to the commutator lugs and clamping rings, there to be dissipated by convection; and since this quantity depends on diameter and speed irrespective of length, it assumes a smaller percentage of the total loss the longer the commutator. In addition to this, the longer the commutator the further removed becomes the mean length from the fanning action of the commutator lugs.

The data acquired as the result of the investigation herein described have been condensed into the curves shown in fig. 1, where deg. F. per watt per square inch are plotted against length of commutator for varying peripheral speeds of commutator. The following example demonstrating the application of these curves is abstracted from the design and test sheets of a 700-kW, 460-V generator directly coupled to a synchronous motor running at 750 r.p.m. A detailed drawing of the commutator is given in fig. 2:—

Armature amperes, 1,540; diameter of commutator, 25 in.; peripheral speed of commutator, 4,910 ft. per min.; effective length of commutator, 12 in.; outside cylindrical area of commutator, 942 sq. in.; number of brush spindles, 8; number of brushes per spindle, 8; size of brush, $1\frac{1}{4}$ in. by $\frac{3}{4}$ in.; grade of brush, soft graphite having friction coefficient = .17, and contact drop = 2 volts; brush pressure, $1\frac{3}{4}$ lb. per sq. inch; total brush contact area, 60 sq. inches; current density at brush contact, 51.3 amperes per sq. inch; current loss $= 1{,}540 \times 2 = 3{,}080$ watts; friction loss $= 60 \times 4{,}910 \times .17 \times 1\frac{3}{4} \times 746/33{,}000 = 1{,}980$ watts; total of commutator losses = 5,060 watts; heat dissipation = 5,060 watts/942 sq. in. = 5.37 watts per sq. inch.

Now, the degrees F. per watt per square inch from the curves of fig. 1 for a commutator 12 in. long running at a peripheral speed of 4,910 ft. per minute is found to be 15.

Therefore, calculated temperature rise $= 5.37 \times 15 = 80.6°$ F.

Temperature rises measured by thermometers on test = 81°, 79°, and 78.5°.

In concluding, the following data are given concerning the degree of accuracy with which the temperatures of commutators can be measured by means of a thermometer applied against the outside cylindrical surface.

The apparatus employed for this research is illustrated in fig. 3; it consists of a cylinder made of 1/16th-in. thick polished copper, in which hot water is gently circulated by means of the inlet and outlet pipes. A thermometer is inserted through a rubber gland to the inside of the cylinder as shown. Readings were taken with thermometers on the outside of the cylinder and compared with the temperatures recorded by the thermometer projected within the cylinder. Cooling curves were then taken with the cylinder left full of water, with circulation cut off. From these curves the rate of heat dissipation per unit area was calculated for various temperatures and conditions, and from this the temperature drop through the copper was ascertained to be within .01° F. in every instance, so for practical purposes the temperature recorded by the thermometer projected within the cylinder may be taken to represent the temperature of the outside surface of the cylinder. The following is an extract from the test figures:—

Remarks.	Temperature reading on thermometer inside cylinder.	Temperature reading on thermometer applied outside cylinder.	Difference.	Air temperature.
Thermometer bulb covered with light woollen pad in still air	164° F.	155° F.	9° F.	62° F.
As above, but in considerable draught of cool air	164° F.	152° F.	12° F.	60° F.
Thermometer applied uncovered in still air	164° F.	149° F.	15° F	61° F.
Thermometer applied uncovered in considerable draught of cool air	164° F.	136° F.	28° F.	60° F.

It was demonstrated that reliable temperature readings can be secured only by taking appreciable care that the thermometer bulb is in contact with the surface of the commutator, and this can be made more certain by a slight pressure of the thermometer against the

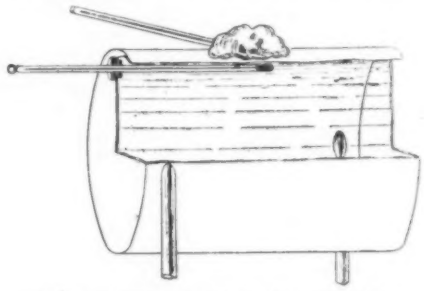


Fig. 3.—Apparatus Used in the Investigation.

commutator. Unless due care is exercised, it is quite easy for the stem only of the thermometer to be in contact with the commutator; or the thermometer to be lifted a few thousandths of an inch off the commutator by the springy nature of the woolen pad; or, for a particle of fluff to slip between the thermometer and the commutator, and under any such circumstances readings may be recorded which are as much as 35° F. too low.

A Diesel-Electric Tanker.—The Standard Oil Co., of California, has ordered a small Diesel-electric tanker, mainly for service between San Francisco and the Hawaiian Islands. She will be similar to two previous vessels that have been constructed, except that the engine-room will be amidships and the electric motors right aft, whereas in the first two ships the engine-room was aft. Two Diesel engine-driven generators, each of 245 kW, will supply a 600-b.h.p. electric motor for propulsion, running at a speed of 130 revolutions per minute.—*Motor Ship.*

Determining the Positions of New Feeding Points.

By D. ROSS.

WHEN the feeders on an interconnected distribution system are approaching the stage of being uneconomically loaded, it becomes essential to decide on a suitable position at which to establish a new feeding point in order to relieve existing feeders.

Obviously this position lies somewhere between existing feeding points—where the voltage drop is a maximum and the current density is a minimum and changes its direction and is fed from other feeders.

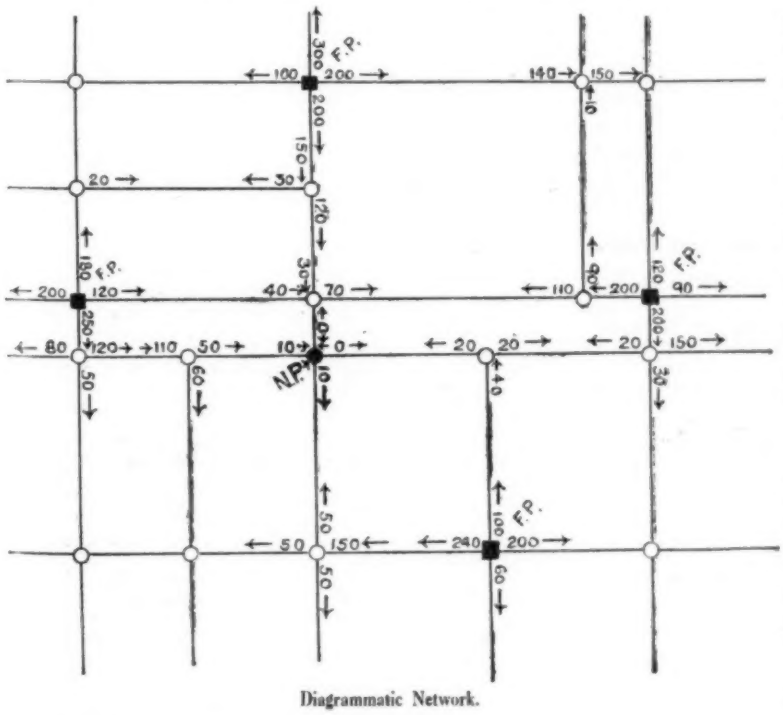
This point, of course, according to B.O.T. regulations, should be known and discriminately fused, so that, in the event of a fault, the area affected will be isolated and the interruption of supply confined to one feeder area.

Unfortunately, with a large interconnected network, these points are not always definitely known, owing to the load on the network being irregularly distributed, the shifting of the load centre due to the fluctuating demands of various consumers, and to an ever-increasing load.

The purpose of this article is to describe a method whereby this neutral position can easily be located experimentally by taking systematic ammeter readings at network disconnecting boxes and pillars and carefully noting the direction and magnitude of current in distributors.

Procure a portable centre zero ammeter of suitable range and six or eight shunts calibrated for the same instrument, suitably designed, so that they can be inserted in section boxes and pillars in place of existing links or fuses. The number of shunts required will be two less than the number of ways in section boxes, as the load on the section without shunts will be the algebraic sum of readings on the other sections.

Ammeter readings should be taken at the various network disconnecting boxes in an area between feeding points for half-an-hour or so during peak load. An examination of the readings obtained will show how the load is distributed and where the neutral point lies.



Diagrammatic Network.

Perhaps a simpler and better way is to draw a diagrammatic arrangement of the network, showing the exact positions of feeding and intersecting points, and plot the average readings at their respective points. It will be evident from the diagram that the neutral point is at intersecting point N.P. The size of the feeder can now be calculated with sufficient accuracy to satisfy technical requirements and existing conditions.

Further, the load that the new feeder will be called upon to deal with can be ascertained by noting the load on the distributors radiating from this point and the surrounding area.

In addition to determining the positions of new feeding points, it will be readily appreciated that the foregoing tests will also serve the purpose of enabling the balance to be improved and maintained with a greater degree of accuracy.

Testing with Kenotrons.

By JAMES NELSON.

THERE is an interesting and important point in the use of valves for producing unidirectional current at high voltage which should be borne in mind by those using

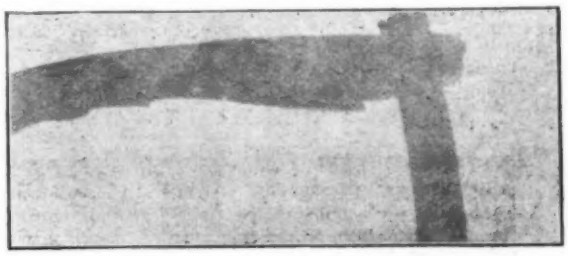


Fig. 1.—X-ray Photograph from a Kenotron.

them, and that is their property of producing X-rays. There is not meant to be anything alarming in this statement; it is only made so that those who come in contact with this type of gear may take precautions.

It is difficult to give any definite figure as to the time required to cause a burn, as the amount of current passing through the tube will necessarily vary with the installation under test, and the voltage it is being tested at. Generally speaking, the distance the operator or spectators would be from the tube would negative any risks, *but* the main point to remember is that X-ray doses are cumulative up to about 28 days, *i.e.*, tests made on the blood after a full erythema dose do not show a normal state until about that time. It will be seen from this that continual short exposures can become equivalent to a long one.

In hospitals, where all tubes are as well protected as possible, it is the custom to make a blood test of the operators at intervals not exceeding three months. The risk can be greatly minimised by keeping well away from the apparatus, as the intensity of the ray varies inversely as the square of the distance. It may not be out of place to quote from an article by Messrs. Schall: "It has become the custom in medical practice to reckon as unit the dose which produces a certain fairly well defined effect on the skin which is called erythema. It shows itself first by a slight redness immediately, or at any rate soon, after the exposure. The colour changes within three weeks to brown, and within seven weeks to a permanent bronzing of the skin. Light-haired persons are about 10 per cent. more sensitive than dark ones. The most sensitive parts

are the neck, shoulders, and abdomen; the face is not considered very sensitive."

In conclusion, it is not intended that this article should cause any alarm, but it can be definitely stated that when this type of apparatus comes into daily use, it will be imperative to thoroughly screen the tubes from the operators. This can be done without obscuring the view, by the use of lead glass windows.

Before these notes were written, an experiment was tried by the writer of exposing an X-ray photographic plate in the vicinity of the tube under working conditions. Upon developing, this plate was shown to have been under the influence of X-rays. The accompanying illustration will make this plain, the clear strips on the negative being due to two pieces of lead laid over the plate during exposure.

Showrooms in Sydney, N.S.W.

THE accompanying illustration is a typical view of the large showrooms of Messrs. W. G. WATSON & CO., LTD., in Sydney, N.S.W.

These premises are situated in the heart of the electrical district of the city, and they constitute, we are informed, the second electrical store of Australia in point of size. There are six floors, occupying in all about 40,000 sq. ft. Being situated between two streets, the building is provided with two entrances. The premises are divided into 14 departments, each of which has a separate line to the City telephone exchange. There are two passenger lifts and a goods lift, as well as two entrances which enable carts to proceed right into the building, where the goods they bear are lifted off and transported to their positions by overhead conveyors.

Messrs. Watson's Showrooms in Sydney, N.S.W.

The lighting of the showrooms is controlled by a separate switchboard, there being a main board for the provision of energy to the appliances which are shown and demonstrated. Automatic telephones are being installed and every modern convenience and system is employed in the company's organisation.

The illustration conveys an excellent impression of roominess which is often lacking in electrical showrooms.

Electrical Development of Germany.—A conference of the Union of German Electricity Supply Undertakings was recently held in Charlottenburg to consider the question of developing the demand for electricity in Germany, particularly for domestic and rural purposes. Among the many papers read at the gathering were the following:—"Electricity for Domestic Purposes, Results and Experiences in Amsterdam," by Dr. Lulofs, of Amsterdam; "Electric Heating," by Dr. Wolf, of the Siemens Electro-Warme Gesellschaft, of Sornewitz; "The Use of Electricity for Ventilating, Cooling, and Refrigerating Purposes," by Herr Lilienthal, of the A.E.G.; "Electricity in Agriculture," by Dr. Petre, of Belgard; "The Way to Increase Electricity Demand," by Dr. Finckh, of the Osram Gesellschaft, Berlin; "Shop-Window Lighting and Display," by Dr. Adolph, of Berlin; and "Electric Vehicles as Current Consumers," by Dr. Beckmann, of the Accumulatorenfabrik Gesellschaft, Berlin.

Correspondence.

Correspondents should forward their communications at the earliest possible moment. *No letter can be published unless we have the writer's name and address in our possession.*

Increased Production—Decreased Unemployment.

I have read with great interest the articles on this subject and have noted that the author is an authority upon matters economic; that, of course, is apparent from the publication, but possibly ideas may come from "the least of the electrical brethren," so in a spirit of great humility may I venture the following:—

When the country was faced with the crisis of the late war, the whole nation worked as one man, and when anyone suggested that private property should be held when the nation required it, he was rightly called a traitor.

In the years of peace following the war, the loss of trade, the sufferings of the unemployed, the loss of private fortunes, must be made good by "private enterprise," and anyone who suggests that in the peace we must work nationally is called a traitor, or if his intentions be good, then a fool and a dangerous fool.

The author of "Increased Production" suggested one valuable means of improving certain trades. To the writer the idea was so good that the opinion formed of the author is that he must be an electrical man because imagination is shown; pure economists have no imagination or humanity, they are bound to a system.

The suggestion made related to an estimate being made of the normal requirements of coal and iron for a fixed period; that a fixed price should be offered to the manufacturers for the estimated quantity by the Government and the market prices then fixed by the Government for the period covered by the estimate. Obviously the author of that suggestion will be called a Socialist, by persons interested in price fluctuations; the writer admires his candid expression of fundamental fact.

Now one matter which must be mentioned in dealing with increased production is that the object aimed at is reduction of the cost of production, it being assumed that if price be sufficiently low the production will be absorbed, but there is a further question.

The large and efficient producers have become large and efficient by reason of specialised production of a particular article; that is, they have grown usually from small beginnings by reason of specialisation, but at all times they have depended upon the firms much smaller than themselves to collectively absorb their production; as an example, the mass production of machine screws, &c. Now it is assumed that it is only necessary to reduce this cost of production to pre-war figures in order to obtain pre-war business, an assumption which may not be correct, because it implies that all the small firms are in the pre-war position to absorb the production at the lower cost.

During the period of currency deflation, and the consequent fall in prices and decreased business, serious losses were incurred by all industrial concerns. This loss has been reflected in writing down the value of share capital and in many cases the re-forming of companies to meet the new conditions; that, of course, applies to limited companies, but what is the position of the smaller and weaker businesses which collectively are the absorbers of the mass production of the larger?

Many of the small firms are not limited liability companies and cannot therefore write down their liabilities, which is actually what manipulation of share capital amounts to (the shareholders lose in that case) so the small firms' liabilities are reduced by bankruptcies in a large number of instances, the effect of which is to reduce the amount of credit of those who "hang on," therefore placing every small firm in a worse position than ever.

Now if by reducing the cost of production it is intended to obtain a larger distribution, it is quite obvious that the basis of distribution must at least be improved at the same time that production costs are lowered; this means that the small firms shall be protected, if not from any motive of humanity, then from the sound business motive that each unit of distribution removed by reason of financial stress, is a loss to the large producers because their market is reduced at the same time.

In matters of this kind it is only necessary to ask this question:—"Do the small firms matter to the larger; if so, is the market for production increased by strengthening them?" Alternatively, if the small firms do not matter then remove the lot and have no means of distribution.

The writer suggests that a national scheme of compulsory limitation of all businesses is necessary, and that once that is done the Trade Facilities Act must apply to place them in

the position to absorb or distribute the mass production of the specialising firms, and further that credits and currency must be increased or decreased, not according to the gold reserves, but in proportion to the productive capacity of industry.

Pence.

New Devices to Meet I.E.E. Wiring Regulations.

Since the publication by the Institution of Electrical Engineers, of "Regulations for the Electrical Equipment of Buildings," popularly known as the "Institution Wiring Rules," there has been considerable controversy as to whether they are beneficial or otherwise to the adoption and expansion of electric lighting and electrical domestic service. I believe the controversy can be shortly summed up as coming under three general heads:—

1. Whether the technical requirements are not too stringent, thus tending to retard the popularising of the use of electricity.

2. Whether it would not have been wiser to have a minimum number of mandatory regulations ensuring a fair factor of safety.

3. That the regulations call for apparatus not yet on the market, and consequently the application of the regulations is rendered both difficult and slow.

Now, I am not at the moment particularly concerned with headings Nos. 1 and 2, but it has come to my knowledge that there is a widespread opinion amongst contractors that the manufacturers of electrical accessories are not at the present time ready to meet the demands for the special devices, such as hand-shield wall plugs, interlocked switchplugs, 3-pin plug sockets, insulated lampholders and switches, &c., called for under these regulations.

Writing with wide experience of the industry, I desire to say such is not the case; every manufacturer of good repute is in a position to supply promptly any or all of the required accessories.

I have no brief for or against these new wiring regulations, but I do think that in fairness to British manufacturers of accessories the fullest publicity should be given to the fact that it is not their fault that contractors cannot comply with the regulations.

E. C. Wansbrough.

London, *December 16th*, 1924.

High- and Low-Temperature Valves.

May I comment on the article which appeared in your issue of November 7th, on high- and low-temperature valves by Mr. Alan L. M. Douglas?—because in my opinion, many of the statements are incorrect, and some of them unfair to the dull emitter valve.

The reference in the second paragraph to emission is misleading. Emission is dependent upon filament temperature in dull emitter valves, just as it is in the case of the high-temperature type. In the latter type it is scarcely correct to say that with a constant filament voltage the telephone or anode current will be so constant as to render the valve silent in action.

Without going into a physical explanation of the causes of crackling, it can, I am sure, be stated that users of high-temperature valves are only too well aware of the objectionable noises inseparable from this type, which, in multi-valve sets, sometimes render high amplification unusable.

The statement in the third paragraph regarding filament attraction with respect to varying space charge is, I am afraid, unintelligible. It is, of course, true that emission being dependent upon the area of heated filament, a large-diameter filament will give greater emission than a smaller one when run at the same voltage and temperature, but this does not mean that a high-temperature valve, owing to its larger-diameter wire, is better in this respect than a dull emitter. On the contrary, the former running at such a temperature as will result in a good useful life, will give an emission of 0.3 amp. per sq. cm., whereas the emission from the latter is three times as great as this when its filament temperature is such that its life may be expected to be many times greater than that of the high-temperature valve.

In the fourth paragraph, filaments of the thoriated tungsten type are indicated, but it is quite incorrect to state that thorium is used as a "coating material," or applied in the manner described. Thorium compounds are capable of high electron emission at low temperatures, but such thermionic emission is not commonly termed "radiation."

Dull emitters of the thoriated tungsten filament type may be more microphonic than high-temperature valves, due to the greater elasticity of their filaments at the lower temperature, but this only becomes serious when several stages of low-frequency amplification are used.

The remark about the decrease of "the control which the grid can exercise" is, I regret to say, quite meaningless.

Correct adjustment of filament control in dull-emitter valves is of importance, as must surely be well known to experienced users of this type.

The statement that emission from dull-emitter valves is not so good as from those of the high-temperature type is, of course, incorrect. For instance, an ordinary "R" valve, on normal voltage, has an emission of about 5 mA. A dull emitter of, say, the D.E.R. type, on normal voltage, gives an average of at least twice this amount.

In the seventh paragraph, the reference to "continual stress of space charge" as being the cause of "filament disintegration" again appears to be meaningless, while the statement that dull emitters are at a disadvantage on the score of filament noises is not correct. It is surely well known that if a quiet circuit is required, dull emitters alone will secure it.

Paragraph eight is difficult to comment upon, particularly as regards the last sentence, because it is difficult to understand the meaning of this.

Chas. F. Trippe.

London, *November 17th*, 1924.

Legal.

Metropolitan-Vickers Electrical Co., Ltd., v. British Thomson-Houston Co., Ltd.

IN the Chancery Division on December 18th, Mr. Justice P. O. Lawrence delivered his considered judgment in this case in which the plantiffs, the registered owners of Letters Patent No. 9,644 of 1912, for an invention of "Improvements relating to Synchronous Dynamo-Electric Machines," granted to Emanuel Rosenberg, alleged that the defendants had infringed the patent by the manufacture, sale and use of rotary converters constructed in accordance with the claiming clauses of the plaintiffs' specification. In particular the plaintiffs complained of the sale towards the end of 1913 by the defendants to the West Hartlepool Corporation of two 300-kW rotary converters constructed as aforesaid.

In the course of a long written judgment, Mr. Justice LAWRENCE, having referred in considerable detail to Rosenberg's specification, said that in construing the first claiming clause it must be borne in mind that there was nothing new either in employing an electric motor for the purpose of starting, speeding up and synchronising a synchronous machine, or in arranging two sets of windings on the same electrical circuit in series so that the total current would have to flow through them both. In his opinion nothing turned upon the "electrically equivalent" connection mentioned in claim 1. The claim, therefore, was for a novel arrangement of known parts for the purpose of bringing about the result of speeding up and synchronising a synchronous machine in an improved manner, *viz.*, by one operation instead of two. Rosenberg evidently based his claim on a certain knowledge that his arrangement if applied by a competent electrical engineer to any type of synchronous machine coupled with any type of suitable electric starting motor, would bring about the automatic synchronisation of the synchronous machine which was the whole purpose of his claim. He therefore abstained from introducing into his claim any mention of any particular type of synchronous machine or starting motor or of any particular windings or of any particular electrical phenomena or of any particular method of operation.

His LORDSHIP then dealt with the question whether the plaintiffs' letters patent were invalid because of the prior publication of Tesla's U.S.A. Patent No. 459,772 of 1891. He said that the substance of Tesla's first and principal claim was of an alternating-current starting motor coupled with a synchronous motor whereby the former started the latter. Fig. 9 of Tesla was the most important. The arrangement shown in that figure was for all practical purposes indistinguishable from fig. 1 of Rosenberg. If, however, the view he had expressed as to the true construction of Rosenberg's claim was right all the evidence on that part of the case became irrelevant because the contention in support of which it was adduced was based on the assumption (which he considered erroneous) that Rosenberg's claim was limited to a selection of machines so designed, paired and wound and operated by a supply current of such a character as to cause the Rosenberg phenomenon in the comprehensive sense in which he understood that expression to have been used by the plaintiffs. So far as the evidence was concerned there was nothing to show that Tesla did not know that his fig. 9 arrangement, if applied under conditions such as prevailed when the oscillogram was taken, would cause the Rosenberg phenomenon. As rotary converters were unknown in 1891 it was, of course, obvious that Tesla did not know that the arrangement could be usefully applied to that particular type of synchronous machine or that certain electrical phenomena would be caused by such application, but in his opinion neither the discovery that Tesla's arrangement could be usefully applied to the modern type of synchronous machines nor the discovery of electrical phenomena caused by any particular application of such arrangement would after the publication of Tesla's specification have formed proper subject matter of letters patent, even if his claim had been framed as a claim for any such discoveries, which was not the case. In the result he had come to the conclusion that the contention that Tesla did not disclose Rosenberg's phenomenon nor the particular pairing of machines required to cause that phenomenon afforded no answer to the plea of prior publication.

On the question of infringement his LORDSHIP said he thought the defendants had taken the whole substance of the arrangement claimed by Rosenberg and that but for the invalidity of the plaintiffs' patent the defendants would have been guilty of infringement. In the result therefore for the

reasons stated the action would be dismissed, the defendants to have the general costs of the action and also the costs of issues raised by the particulars of objections. The defendants would be ordered to pay to the plaintiffs the costs of the issue raised by the particulars of breaches and the order would contain the usual directions of a set-off. The plaintiffs would have the usual certificates in respect of breaches and the defendants the usual certificates in respect of the particulars of objections.

Loss of Office : Compensation Claim.

As Referee under the Electricity (Supply) Act, 1919, Sir William Mackenzie, K.C., heard a claim against the Ayrshire Electricity Board for compensation for loss of office. It is stated that although there have been several claims for compensation under the Act, and compensation has been granted in England and Wales, this is the first occasion on which a claim has gone to arbitration in Scotland. In the present case Mr. Robert Alexander was employed for some years as a mechanical fitter in the electricity department of the Ayr Corporation, and on the constitution of the Ayrshire Electricity Board under the Ayrshire Electricity Order, 1924, which transferred the electricity department of Ayr Town Council to the Board, his services were no longer required. Mr. John Storrie, of the Amalgamated Engineering Union, urged the claim for compensation, while Mr. W. C. Bexon conducted the case for the Board.

Having heard the evidence of the claimant and representatives of the Board, Sir WM. MACKENZIE stated that he would communicate his decision to the parties in a few days.

Holland v. Barron.

AT Blackpool County Court, on December 17th, Mr. Nicholas Holland, of Fleetwood, sued Messrs. Robt. Barron, engineers, of Fleetwood, for £43 for breach of condition in the sale of an Austin petrol generating set.

Plaintiff said that he agreed to buy the set for £27 and he was promised delivery. When he called to pay the balance he was told "Your money is no use. We have received another customer's cheque." Plaintiff accordingly purchased a Coventry lighting set for £70 and he claimed as damages the difference between the two prices.

Mr. R. BARRON, A.M.I.E.E., managing director of the defendant company, said he gave a man named Forshaw permission to sell the set for £26. As a result of a message he received he told Holland that Forshaw had sold the lighting set, and offered him his £7 deposit back, but Holland would not accept it. He recovered £26 for the machine, whereas if he had sold to Holland he would have been £1 better off.

JUDGE BRADLEY gave judgment for the defendants with costs.

British Thomson-Houston Co., Ltd., v. British Insulated and Helsby Cables, Ltd.

IN the House of Lords on December 16th, Sir ARTHUR COLEFAX, K.C., continued his argument on behalf of the appellants in this case, the British Thomson-Houston Co., Ltd., referring largely to documents and evidence. He also read and criticised the specifications.

On December 18th, Counsel concluded his argument and Mr. JAMES HUNTER GRAY, K.C., followed on the same side, submitting that the letters patent in respect of the year 1909 were valid, and had been infringed. In these circumstances the judgment of the Court of Appeal was erroneous and should be reversed, and that of Mr. Justice Russell be restored. Counsel had already argued the similar point raised in the Scottish case of Charlesworth, Peebles & Co. *v.* the British Thomson-Houston Co., and he proceeded to amplify his former address.

When Mr. Hunter Gray had concluded his speech, LORD HALDANE announced that the consideration would be adjourned *sine die*, and if their Lordships should desire to hear Counsel for the respondents (British Insulated & Helsby Cables, Ltd.), they would let them know. In this way judgment stands reserved.

Electricity Supply Company Fined.

THE Frome Electricity Supply Company was fined the maximum penalty of £100 at the Frome police court on December 19th for failing to securely fence mechanical stokers, as a result of which a stoker named Dray was caught in the shafting. The company's attention, it was stated, had previously been drawn to the omission by the factory inspector. The magistrates were told that had it not been for the fact that Dray's coat gave way he would probably have been killed.

Fatality.—At an inquest into the death of a 7-year-old schoolboy, Kenneth Davis, of Pontypridd, it was stated that the boy fell upon a pipe containing an electric cable. The pipe broke, cutting the cable, and the child received a shock at 230 V, being killed immediately.

Parliamentary.

[By Our Special Parliamentary Reporter.]

Engineering Hours.—On December 16th, Mr. BETTERTON, Parliamentary Secretary to the Ministry of Labour, informed Sir P. Richardson that the normal weekly hours of labour at present in the engineering and shipbuilding industries in Great Britain and Northern Ireland were 47. As regarded Germany and Holland, the normal hours were as follows:—Germany: Engineering 51 to 57½, Shipbuilding 54 (except at Dantzig, 48); Holland: Engineering 48 hours or less, generally, Shipbuilding 48 to 55½.

L.N.E.R. Electrification.—On December 16th, Mr. R. MORRISON asked the Minister of Transport if he had any information as to whether the London and North-Eastern Railway Company intended to proceed further with its proposals to electrify the Northern suburban line.

Colonel ASHLEY said he was informed that the company had not yet reached a decision in the matter.

The "Beam" System.—On December 16th, Sir W. MITCHELL-THOMSON, Postmaster-General, informed Col. Wedgwood that he had no official information as to the negotiations proceeding with the Indian Government for the erection of a "beam" radio station in India. He understood, however, that the Indian Government intended that a high-power station should be erected in India without undue delay, whether or not a "beam" station was provided; and this course was favoured by the Admiralty. The question whether the operation of a "beam" station would interfere with broadcasting would depend in part upon the site of the station, and this was a matter which was being borne in mind in connection with the selection of sites for the "beam" stations in this country. He had no doubt that it would also be borne in mind by the Indian Government in connection with the selection of sites in India.

Safeguarding of Industries.—On December 17th, Mr. BALDWIN, the Prime Minister, announced his new proposals for the safeguarding of industries. Dealing with Part I of the Act, which covers a few select industries classified by the late Coalition Government as being of national importance, he explained the progress made, which was very satisfactory. He said that the manufacture of optical glass, which had been done in this country previous to the war to only a very small extent, had been singularly successful. A great deal of glass for scientific instruments was being produced in this country. Gauges and measuring instruments of precision, engineers' tools which used to come exclusively from the United States, although they were not yet produced in quantities or grades, were getting a good hold now in this country. We now were able to manufacture the radio valve and the X-ray tube as well as anyone else. That was a very good record for a few years' work in industries that might have been said to have had no root in this country when the Act was first passed.

Mr. Baldwin explained that it was intended next year to introduce a Bill to take the place of Part II of the Act, which was allowed to lapse last summer. All industries would be on the same footing in applying to come within the scope of that Bill. Any industry desiring to be safeguarded must be one of substantial importance, and it must be efficient. It must be subject to exceptional competition arising from such things as depreciated exchanges, bounties or subsidies, and lower wages in foreign countries or longer hours. He was not at all sure that it would not be fair to take into account the difference in taxation as between this country and others. Any duty levied should be a general and not a particular one. A preference on those duties should be given to the Dominions, and proof would have to be given, as under the last Act, to a committee.

Electricity Supply.—Referring to this subject, the Prime Minister said the schemes which were submitted to the last Government were being carefully examined with a view to acting on them if it could be proved that such action would be for the benefit of the country. More than that he could not say at the moment. He hoped that it might be possible in the course of the present Parliamentary Session, when work was resumed next year, to report progress on that matter.

Smoke Abatement.—On December 17th, Sir K. WOOD, Under Secretary to the Ministry of Health, informed Sir H. Brittain that the Government contemplated the introduction of a Smoke Abatement Bill as soon as a convenient opportunity arose, but he could not promise that the Bill would be introduced before 1926.

Iron and Steel Imports.—On December 17th, Mr. A. M. SAMUEL, Secretary to the Overseas Trade Department, supplied Sir F. Wise with figures showing that the imports from France and Belgium of iron and steel and manufactures thereof had steadily increased during the past three years.

Electricity Commissioners.—On December 18th, Mr. R. MORRISON asked the Minister of Transport whether he proposed to introduce legislation to restore the compulsory powers of the Electricity Commissioners.

Colonel ASHLEY referred the hon. member to the statement made by the Prime Minister that the schemes of electrical development which were submitted to the late Government

were being very carefully examined with a view to acting upon them if it could be proved that such action would be for the benefit of the country.

Training in Government Factories.—On December 18th, Sir A. STEEL-MAITLAND informed Capt. Bowyer that the number of men in training in Government Instructional Factories was approximately 3,400. There were approximately 900 men in Great Britain and 1,700 men in Ireland awaiting training. Some of these men were at present under treatment and, therefore, were not available for training. The number of men awaiting improverships was approximately 3,000.

L.M.S.R. Electrification.—On December 18th, Mr. W. THORNE asked the Minister of Transport, if he had any information as to whether the London, Midland, and Scottish Railway Company intended to proceed further with its proposals to electrify the Fenchurch and Southend Railway, which would be the means of finding work for some hundreds of workmen.

Colonel ASHLEY said the railway company informed him that it had no immediate proposals ready for embarking upon this work. So far as the question of unemployment was concerned, he would, however, call attention to the programme published by the company, which totalled £14,000,000, and would provide a considerable amount of work in the immediate future.

New Wireless Telegraphy Bill.—On December 18th, Lord WOLMER, Assistant Postmaster-General, informed Mr. Forrest that the new Bill to amend the Wireless Telegraphy Act would deal retrospectively with existing radio licences so far as was considered necessary for removing doubts as to the interpretation of certain provisions in the present Act.

Radio Imports.—On December 19th, Mr. RAMSDEN asked the Postmaster-General whether, before deciding on the removal of the present regulations prohibiting the importation of radio apparatus, he would consider its effect on the state of unemployment in the industry.

Lord Wolmer, the Assistant P.M.G., said that before coming to a decision on this question, the Postmaster-General took into account all relevant considerations, but, in view of the definite expression of opinion by the Broadcasting Committee of 1923, in which the Postmaster-General concurred, that radio receiving licences should contain no condition affecting the origin of the apparatus, he had not considered it possible to extend the operation of the existing restrictive provisions in the licence beyond December 31st, 1924, the date provided for in the supplementary agreement with the British Broadcasting Company.

New Telephone Cable.—On December 19th, Sir W. MITCHELL-THOMSON, Postmaster-General, informed Mr. Baker that expert advice was taken as to the best route for the new trunk telephone cable across the Severn at New Passage to link London with South Wales, but owing to difficulties encountered during the laying operations the course originally charted was departed from. This might have contributed to the failure of the cable in February, 1923. The cable had now been recovered and replaced by another through the Severn Tunnel.

Adjournment.—Parliament adjourned on December 19th until February 10th.

Business Notes.

Bankruptcy Proceedings.—C. A. HENDERSON, insulating material merchant, 63, Queen Victoria Street, E.C., and The Grove, Sutton.—An application for an order of discharge was made on December 12th at the London Bankruptcy Court on behalf of this bankrupt, who failed in May, 1922. Mr. T. Vyvyan, Official Receiver, reported that he considered that the debtor's estimate of his liabilities at £23,405 was approximately correct. The assets which were valued by the debtor at £18,565, had, however, realised only £101, and nothing further was anticipated. The debtor attributed his insolvency to falling off of his business since June, 1921, owing to the curtailment of his credit consequent on its becoming known in the trade that he contemplated manufacturing ebonite for himself, instead of continuing to buy it, to bad debts both trade and personal, to heavy discount charges, and to interest on loans. A full set of books of account and balance sheets had been produced. The debtor said that he realised that he was insolvent in June, 1921, when his credit was stopped by a company, but admitted that judgment had been obtained against him a year previously for £300, by the Climax Stopper & Ebonite Co., Limited, and that he had contracted debts partly for goods supplied and partly for cash advanced since then for £4,800 exclusive of the claim of the Caledonian Insurance Co., who were returned as unsecured creditors for £18,000 money lent in October, 1921. The Official Receiver stated that a receiving order had also been made against the debtor in 1906, when the Court approved a composition of 7s. 6d. in the £, the liabilities then being rated at £8,815. That receiving order was discharged in March of the following year. The present application for discharge was opposed on the grounds that the debtor's assets were not of a value equal to 10s. in the £, that he had continued to trade with knowledge of insolvency, that he had contracted a debt provable in the bankruptcy without any reasonable ground of expectation of being able to pay it, and that a receiving order had been made against him on a former occasion. Counsel appeared on behalf of the debtor and said that the claim of the Caledonian Insurance Co. had been discharged to the extent of £10,000. The debtor was willing to consent to judgment in the sum of £500 to be paid out of his future earnings as a condition of receiving his immediate discharge. Mr. Registrar Francke agreed to this judgment, and made an order accordingly.

JAMES BRUCE SHIELDS, 221, Linthorpe Road, Middlesbrough, master plumber and electrician.—The first meeting of the creditors of the above was held recently at the Official Receiver's offices, 80, High Street, Stockton-on-Tees. The statement of affairs showed liabilities of £1,215, and net assets of £474, or a deficiency of £740. On leaving the Army in 1919 debtor commenced business as a plumber and electrician with £28 capital, his war gratuity. He attributed his failure to bad debts and losses on the business generally. Mr. C. P. Barrowcliff, of Albert Road, Middlesbrough, was appointed trustee of the estate, and a committee of inspection was nominated.

B. BARNETT, electrical engineer, 104, Whitechapel Road, E.—The adjourned hearing of this debtor's application for discharge came before Mr. Registrar Hope at the London Bankruptcy Court on December 11th. He was adjudged bankrupt on December 30th, 1921, and, according to the report of the trustee in bankruptcy, if certain proofs of debt are admitted to rank against the estate the total unsecured indebtedness will amount to £2,370. The assets, which were valued by the debtor at £1,146, have realised £137. He attributed his insolvency to loss in connection with a motor business, to the costs of repairs to 104, Whitechapel Road, to loss on the purchase and sale of plant and machinery, and to law costs. The Official Receiver had opposed the application on statutory grounds, and it was adjourned in order that it might be ascertained from the proofs of debt what debts had been contracted after the appointment of a receiver of a partnership business of electrical engineers, and the time when the debtor began business again on his own account. His Honour suspended the discharge for two years from the date when the application originally came before the Court.

E. E. CLARKE, "Dagmar," Halden Road, Heysham, late of Morecambe, Lancs., electrical engineer.—The public examination of this debtor was held recently at Preston. According to the statement of affairs there was a deficiency of £477. Debtor attributed his failure to loss on a patent. It appeared that he commenced business on his own account at Albert Road, Morecambe, in 1918, and for a time was successful. In 1920 he executed a deed of assignment. Subsequently he recommenced business at Alhambra Buildings with £10 capital, borrowed money, this concern being a success at first. He invented a game and entered into partnership with another for its manufacture. They took premises for the purpose and eight or nine men were employed. About 12 months later the partnership was dissolved. In reply to questions debtor said there was a proposed partnership between himself and another man, but he received only £115 out of the £250 which was to have been introduced. He said there was never a proper deed of partnership drawn up. He admitted that a receiving order was made against him in 1899 and that he had never obtained his discharge from those proceedings. He alleged that if the patent had been properly worked, he could have paid his liabilities in full. The examination was adjourned.

W. M. HORSFALL, electrical engineer, 7, Redcross Street, Liverpool.—Last day for proofs for dividend, January 3rd. Trustee, Mr. E. D. Symond, 11, Dale Street, Liverpool.

W. J. DUFFY, electrical engineer, 54, Gellatly Street, Dundee.—The estates of the above were sequestrated by the Sheriff of Forfar on December 11th. A meeting to elect a trustee and commissioner was called for December 23rd, at the Royal British Hotel, Dundee. Mr. A. B. Petrie, agent, 84, Commercial Street, Dundee.

L. J. JAMES (W. G. James & Son), electrical engineer, 62, Canterbury Street, Gillingham, and 137, High Street, Rochester.—Last day for proofs for dividend, December 30th; trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

A. JONES, electrical engineer, 2, Robert Street, Ynysybwl, Glam.—First and final dividend of 10d. in the £, payable at the Official Receiver's office, 34, Park Place, Cardiff.

H. R. ALTHORP, electrical engineer and contractor, 13, Wellington Crescent, Shipley, Yorks.—Receiving order made December 11th, on debtor's own petition. First meeting,

December 24th, at the Official Receiver's office, 12, Duke Street, Bradford. Public examination, January 12th, at the County Court, Bradford.

J. E. BRYNE, electrical contractor, 3, Wells Yard, Waterworks Street, Kingston-upon-Hull.—First meeting, December 30th, at the Official Receiver's office, 37, Scale Lane, Hull. Public examination, January 19th, at the Guildhall, Hull.

E. W. J. WHITELOCK, electrical engineer, 7, Cheapside, Luton.—Order made for immediate discharge.

A. MEADOWS, electrician, The Arcade, Penzance.—Receiving order made December 16th, on creditor's petition.

Company Liquidations.—BRISBANE TRAMWAYS CO., LTD.—Winding up voluntarily. Liquidator, Mr. J. Fraser, 31, Copthall Avenue, E.C.2. Meeting of creditors at the Liquidator's offices December 29th.

BRISBANE ELECTRIC TRAMWAYS INVESTMENT CO., LTD.—Winding up voluntarily. Liquidator, Mr. J. Fraser, 31, Copthall Avenue, E.C. Meeting of creditors at the Liquidator's offices December 29th.

PONSFORD & MACHARDY, LTD., Dundee, electrical engineers, &c.—The creditors interested herein were called together recently, when a statement of affairs was presented which showed liabilities of £7,673, of which £3,143 was due to the trade. The assets were estimated to realise £6,389, from which had to be deducted £338 for preferential claims, leaving net assets of £6,060, or a deficiency of £1,613. The statement showed an apparent dividend of 15s. 9d. in the £, subject to the expenses of realisation. It was stated that the last balance sheet of the company was dated December 31st, 1923, and it showed losses in trading amounting to some £3,800. The creditors passed a resolution confirming the appointment of Mr. R. C. Thompson as the liquidator of the company, while an advisory committee was also appointed. The creditors include:—

	£		£
Macintosh Cable Co., Ltd. ...	435	Finlay, A.	68
General Electric Co., Ltd. ...	286	Dormer & Hamlyn	67
Osler, F. & C.	90	Oldham & Son	65
Inventum Co.	88	Brand, Charles	56
Ruston & Hornsby, Ltd.	110	Marconiphone, Ltd.	64
Shallcross & Co.	75	Berry's Electric, Ltd.	39
Sunlight Manufacturing Co. ...	73	General Radio Co.	36
Gordon, J. W.	72	Robinson & Hands	36
Rotax (M. A.) Co., Ltd. ...	68		

SOUTH YORKSHIRE ELECTRIC WELDING CO., LTD.—A meeting of members is called for January 14th, at 25, Market Place, Mansfield, to hear an account of the winding up from the Liquidator, Mr. G. W. Yeomans.

ELECTRICAL CONTRACTS & MAINTENANCE CO., LTD.—First meetings of creditors and contributories, January 2nd, at Carey Street, W.C.

NORWOOD WHOLESALE FITTINGS SUPPLY CO., LTD.—Winding up voluntarily. Liquidator, Mr. A. J. P. Coleman, 174, High Street, Acton, W.3. Particulars of claims to the liquidator by December 30th. Meeting of creditors, December 31st, at the Great Eastern Hotel, Liverpool Street, E.C.

Dissolutions of Partnership.—R. H. CLARKE & CO., dealers in electric light fittings, &c., 449, London Road, Norbury, Surrey.—Mr. H. W. Bacon and Mr. R. H. Clarke have dissolved partnership. Mr. Bacon will attend to debts and continue the business.

T. and H. JOYCE, electrical wholesalers, 210B, Shaftesbury Avenue, W.C.2.—Mr. T. H. Joyce and Mr. W. A. Speed have dissolved partnership. Mr. Joyce will attend to debts.

THOMPSON & WETTON, electrical engineers, McEwen's Yard, Millgate, Wigan.—Mr. R. H. Thompson and Mr. E. Wetton have dissolved partnership. Mr. Thompson will attend to debts and continue the business under the old style.

MILNS & PHILLIPS, electrical engineers, High Street, Birmingham.—The partnership between Mr. W. A. Phillips and Mr. W. E. Milns has been dissolved by a judgment of the County Court of Warwickshire, held at Birmingham, on December 11th, as from May 20th, 1923.

Private Arrangements.—TRESILLIAN MOTORS, LTD., manufacturers and agents for wireless accessories, &c., 52, Bedford Street, and 59, Queen Street, Cardiff.—A meeting of the creditors was held recently at Cardiff, when Mr. J. A. Chappell, of the Marconiphone Co., Ltd., the principal trade creditors, was elected to the chair. The statement of affairs presented showed liabilities of £3,934, and the assets were estimated to realise £1,020, less £95 for preferential claims, leaving net assets of £925, or a deficiency of £3,009. As regarded the shareholders there was a deficiency of £5,009. It was reported that the company was registered in March, 1920, with a nominal capital of £2,000, and it acquired the assets of the Redio Motor Service, of Cardiff. The purchase consideration was £1,470, which was satisfied by the allotment of 1,400 shares of £1 each, while the balance of £70 was retained to discharge the existing liabilities. Last January the company commenced in the wholesale radio trade, and during the present year the combined turnover had been in excess of £1,700 per month. The expenses of the company were in the neighbourhood of £100 a week. The creditors had been called together owing to the fact that the company was being pressed and execution was being levied by two radio firms. When the radio department started business was brisk, but it fell off during the summer season. The demand had again improved, but the company was faced with a shortage of capital.

A suggestion was made that the creditors should agree to allow their accounts to stand over for the time being, but after a lengthy discussion a resolution was passed asking the debenture holders to appoint Mr. S. E. Clutterbuck, of Cardiff, as receiver, whilst a committee was appointed to investigate the matter and negotiate for a reasonable offer. The committee consisted of representatives of the Marconiphone Co., Ltd., H. J. Cridland, the General Electric Co., Ltd., Brown Bros., Ltd., S.W. Wireless Co., P. Capel and Co., and Poppleton & Appleby.

The following are creditors:—

	£		£
Anglo-American Oil Co.	23	Goswell Engineering Co.	36
Bell Punch Co.	26	General Radio Co.	55
British Petroleum Co.	52	Hart Accumulator Co., Ltd. ...	56
W. & A. Bates	58	Igranic Electric Co., Ltd. ...	103
H. J. Gridland	82	W. Lewis & Sons	76
Glice Co.	35	London Electric Co.	87
F. Preston	32	McLeod & McLeod	38
Shell-Mex Co.	168	Metropolitan-Vickers Electrical Co., Ltd	67
United British Insurance Co. ...	72	Marconiphone Co., Ltd.	247
Brown Bros., Ltd.	154	Pressland Supplies, Ltd.	73
British Thomson-Houston Co., Ltd.	85	Radio Communication Co., Ltd.	176
Burndept, Ltd.	86	Scientific Supply Co.	27
Brandes, Ltd.	74	Sterling Telephone & Electric Co., Ltd.	56
Clayton Rubber Co.	27	Siemens Bros. & Co., Ltd. ...	106
J. W. Cox	30	St. Helens Cable & Rubber Co., Ltd.	25
Drake & Gorham, Ltd.	73	South Wales Wireless Co. ...	138
Edison & Walker	28	Ward & Goldstone, Ltd.	37
General Electric Co., Ltd. ...	164		
A. Graham & Co.	62		

E. E. STOCKWELL, trading as E. & E. Stockwell, electrical contractor, 164a, Pentonville Road, N.—A meeting of creditors was held on December 18th, when a statement of affairs was presented which showed liabilities of £1,394, of which £895 was due to the trade and £498 to cash creditors. The assets totalled £236, less £10 for preferential claims, leaving net assets of £226, or a deficiency of £1,168. The statement showed approximately 3s. 3d. in the £. The debtor's solicitor stated that his client had been served with a writ by the principal trade creditor. The debtor wished to continue the business, and desired to submit an offer of a composition of 5s. in the £, payable within two months. A friend of the debtor's was prepared to lend him £100 on the security of his household furniture, whilst cash creditors for £370 would withdraw their claims. The present position was due to lack of capital, losses on contracts and legal expenses. The debtor started trading about three years ago with a small capital, and various contracts which he could have secured he had to let go owing to lack of capital. The debtor had one contract with a motor firm on which he lost £60, whilst his suppliers sued him, and he had to face legal expenses of £150. The debtor entered into a contract to install electric lighting in schools at Croydon. The work had to be carried out during the holidays, but a strike took place, and the work could not be completed in time, and he lost heavily owing to the cost of overtime. The contract was for 770 points, and he estimated that the cost of labour along was £660, and that he lost nearly £400 on the contract. In answer to questions it was stated that the drawings had averaged about £4 10s. a week. Certain creditors were pressing, and one execution had been levied, but had been paid out. After some discussion it was decided that the meeting should be adjourned for 14 days in order that the debtor might obtain a satisfactory guarantee for a composition of 5s. in the £. The following are creditors:—

	£		£
Belling & Co.	21	Henley's, W. T., Telegraph Works Co., Ltd.	50
Condor Lamps, Ltd.	24		
General Electric Co., Ltd. ...	230	Lighting and Heating Co. ...	294
Sloan Electric Co.	34		

Trade Announcements.—MESSRS. POWER WIRELESS, of Ilford, have removed to Wexham Road, Slough, Bucks.

A wireless department has been opened by MESSRS. MUNDIN BROS., of 35, Abington Street, Northampton.

The LONDON ELECTRIC WIRE CO. & SMITHS, LTD., of Playhouse Yard, Golden Lane, London, E.C.1, have secured the sole selling rights of the insulating specialities manufactured by the Standard Varnish Works (including Voltalac and standard air-drying insulating varnish), and large stocks will be carried in London. All varnishes are tested before leaving the Leyton factory and the Technical Research Laboratory is being extended.

Catalogues and Lists.—MESSRS. TOWNSON & MERCER, LTD., 34, Camomile Street, E.C.3.—An illustrated and priced catalogue dealing with electric furnaces for use in the laboratory.

MR. LESLIE MILLER, Avonhurst, Rural Way, Streatham, S.W.16.—A pamphlet describing oscillating crystals which, it is claimed, can be employed in the place of valves in certain circumstances.

AUTOMATIC & ELECTRIC FURNACES, LTD., 173-175, Farringdon Road, E.C.1.—"Heat Treatment Bulletin" No. 34, dealing with the hardening of taps by means of the firm's electric furnaces.

MESSRS. WATSON & SONS (ELECTRO-MEDICAL), LTD., Sunic House, Parker Street, Kingsway, W.C.2.—Bulletins Nos. 65, dealing with the "Sunic" intensifier screen; 71, describing the "Sunic" Potter-Bucky diaphragm; and 72, a list of second-hand X-ray and electromedical apparatus for sale.

MESSRS. SIEMENS BROS. & CO., LTD., Woolwich, S.E.18.—A pamphlet dealing with ebonite for radio purposes, with dimensioned illustrations of stock components.

MESSRS. SYDNEY JONES & CO. (LONDON), LTD., Dudley House, 28, Endell Street, W.C.2.—An illustrated price list of radio components and accessories.

MESSRS. CECIL HODGES & CO., LTD., Empire Works, Dalston Lane, E.8.—List No. 106, containing illustrations and prices of "Empirelight" small generating sets.

THE JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1.—A folder illustrating several examples of the company's electric fires, with details and prices.

MESSRS. W. J. FURSE & CO., LTD., Traffic Street, Nottingham.—An illustrated and priced folder dealing with lightning conductor fittings of a variety of types.

MESSRS. GENT & CO., LTD., Faraday Works, Leicester.—Leaflet 84b, illustrating and describing several examples of the company's "Tangent" terminals.

MESSRS. A. C. COSSOR, LTD., Aberdeen Lane, Highbury Grove, N.5.—Illustrated folders describing the construction and working of "Wuncell" radio valves.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—Illustrated pamphlets dealing with the "Radiola" portable receiver, loud speakers and amplifiers, and a loading coil for the reception of Eiffel Tower signals. Also a mailing card illustrating and describing the "B.T.H." shop-window floodlight.

Calendars and Diaries.—MESSRS. CROMPTON & CO., LTD., Chelmsford, have prepared a wall calendar with monthly bold-figured date sheets, each of which also has a good picture of one of their manufactures.

From MESSRS. JOHN ARMSTRONG & CO. (MANCHESTER), LTD., Barton Square, St. Ann Street, Manchester, we have received a wall calendar with small monthly date slips. It bears an attractive picture, in colour, of a modern girl.

MR. BERTRAM PRIESTMAN'S charming landscape "Poplars of the Maas," is beautifully produced as the coloured feature of a large calendar (23 in. by 18 in.), issued by MESSRS. AITON AND CO., LTD., of Derby.

The NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO. has prepared a wall calendar for 1925, telling the public to "Use Electricity." Each weekly slip has also the current month's dates.

THE POWER EQUIPMENT CO., LTD., of Kingsbury Works, The Hyde, Hendon, London, N.W.9, has prepared a 1925 calendar with daily date slips with large figures, the block being mounted on a stout white and gold card, on the back of which is a calendar for the complete year.

The neatest thing in desk date contrivances that has yet reached us is a small metal stand with celluloid strips bearing the months in bold black lettering, above which are spaces for the dates, which are altered by knobs which turn revolving disks. It has been prepared by MESSRS. CRYSELCO, LTD., of Kempston Works, Bedford.

A pocket diary received from the STANTON IRONWORKS CO., LTD., contains a number of tables giving particulars of iron pipes, bends, &c.

MESSRS. HASLAM & STRETTON (ENGINEERING AND MOTOR UTILITIES), LTD., of 11, Windsor Place, Cardiff, have sent us a wall calendar for 1925.

A wall calendar showing a Condor electric lamp on a very red sky has been received from CONDOR, VENLO (Holland).

From the S.E.A. Co., LTD., of Lichfield Street, Hanley, there has come to hand a wall calendar. Each sheet has the dates for two months and a humorous wireless picture in colour.

From the WALKER ELECTRICAL SERVICE, Annandale Street, Edinburgh, we have received a wall calendar for 1925 with monthly sheets, each of which is a quarterly calendar too.

"Coming My Way?" asks the lady driver who forms the pictorial feature of a calendar issued by the LONDON MAGNETO REPAIRING & WINDING CO., LTD., of 78, Hampstead Road, Euston, London, N.W.1.

A wall calendar with daily date slips in large clear figuring has been prepared by Messrs. T. J. GRAINGER & CO., LTD., 31 Side, Newcastle-on-Tyne.

We have received from Mr. L. W. FOOTE, of 73, Plymouth Road, Penarth, an artistic wall calendar. The study "In Confidence" is very pleasing.

A French Amplion Company.—A new company has just been formed in Paris (131, Rue de Vaugirard), with a capital of 100,000 francs and the title La Compagnie Francaise Amplion, to undertake the sale of Amplion loud speakers in France. Mr. Edward A. Graham, the proprietor of the English business, is one of the directors.

America and German Competition.—*Commerce Reports* says that German competition has become an obsession with a great many American exporters, who think that their chances in foreign markets are extremely poor if Germany is also in the field. Our contemporary shows that in spite of this competition both the United States and Great Britain have increased their exports of machinery to Italy in the last three or four years. This has taken place in spite of the fact that German interests are very strong in Italy. The article concludes with the following words: "It is time to lose our diffidence and awake to advantages made possible by the lessening of competition from low-exchange countries."

Wembley Next Year.—*British Industries* reports that at a meeting of the Executive Committee of the Federation of British Industries, Sir Eric Geddes stated that as it had been finally decided that the British Empire Exhibition should be re-opened in 1925, there were several matters which had arisen during the past year upon which it might be thought desirable to approach the Exhibition authorities. Mr. Nugent, the director, then went into the different questions that had been raised, including such matters as the granting of sole concessions to firms, the employment of foreign materials and goods by concessionaires, the exhibition of goods not entirely of Empire manufacture, the allocation of special days for business visitors to the Palaces of Industry and Engineering, and the lighting of the Palace of Industry. It was agreed that a letter embodying these points should be sent to the Exhibition authorities.

Wireless Exhibition.—CHICAGO RADIO SHOW.—It is claimed that the third annual Chicago Radio Show, which was held from November 18th to November 23rd at the Coliseum, was by far the most successful industrial exhibition ever held in the United States. The total attendance was 173,200, and the wholesale business transacted by the exhibitors was more than double that of the New York fair. There were 239 exhibitors, and they booked over $6,500,000 worth of orders. Several times during the week the management was forced temporarily to discontinue ticket selling because of the crowded condition of the huge hall, and when the exhibition closed it was still packed to the doors. The floor space was nearly 100,000 sq. ft. The hall was almost as crowded during the daily "wholesale buyers' hours" (from 11 a.m. to 1 p.m.) as it was when the doors were open to the general public. Orders numbering 984 were booked from European countries, and close upon 1,400 orders were taken from dealers in Mexico, Central and South America.

A feature of the show was a collection of the world's smallest radio devices. None of these tiny instruments weighed over an ounce, and some weighed but a few pennyweights. Among these miniature models was a workable loud speaker made of solid gold, which was less than five-eighths of an inch long and half an inch high; another was a perfect telephone receiver considerably smaller than a shoe button; a crystal set which actually received broadcasting was but three-eighths of an inch square; and another, which was about the size of an ordinary die, had a perfect little tuning coil, a crystal detector, and two switches mounted on a tiny panel. Amongst the foreign companies represented were the Acme Production Co., of Birmingham; Burndept, Ltd., of London; the General Radio Co., Ltd., of London; and the M-L Magneto Syndicate, Coventry.

German Turbines for Norway.—It is reported from Christiania that in addition to the placing with a German firm of the order for one of the two turbines forming the first instalment of the plant at the new Nore hydro-electric works, the Government authorities have now decided to allot the order for the second turbine also to the German firm. As the Norwegian krone has recently appreciated in relation to the dollar and the price of the turbines is stipulated in kronen with a sliding scale according to the quotation of the dollar, the price of the second turbine will work out at about one half the amount of the tender submitted by Norwegian firms.

German Wireless Patents.—A Union of German Manufacturers of Wireless Components and Accessories has just been formed in Berlin to protect the interests of the trade, particularly from the point of view of patents.

The Telefunken Gesellschaft fur Drahtlose Telegraphie, of Berlin, has issued a warning against infringements of its patents in respect of wireless valves.

New Swiss Company.—Under the title Perpetua Gesellschaft a new company has lately been formed in Herbetswil (Canton of Solothurn), to manufacture a new clock actuated by means of current from electric lighting circuits.

German Radio Exports.—A *Commerce Reports* note states that the exports of radio equipment from Germany have grown considerably during the past three years, according to recent statistics. In the first six months of the current year Germany's exports to Great Britain amounted to 223 metric tons; Sweden received 86 tons; Argentina, 24 tons; the Netherlands, 23 tons; Denmark, 13 tons; China, 10 tons; and the United States, 9 tons, out of a total of 520 tons.

An American Forecast for 1925.—A long period of calm is expected in the United States after the turbulence of the presidential election, business being free to go ahead unhampered by further obligations in the way of taxation, &c. *Electrical Merchandising* in a forecast of the coming year's business sees nothing but increased prosperity generally and for the electrical industry it predicts further success. Our contemporary points out that there will be 1,000,000 more homes to wire next year, and to "appliance." There will be 300,000 more stores, offices and commercial businesses to equip, and thousands of new factories. More and more appliances will be sold to the 12,000,000 homes already using electricity but all very inadequately equipped. Probably a million radio sets will be marketed. "Every electrical man faces a bigger opportunity than he has ever had within his reach before, because the electrical market is pyramiding year by year, bigger and bigger because a million and a half more homes begin each year to buy electrical goods."

A Mullard Anniversary. — On Tuesday, December 16th, the original male staff of the Mullard Radio Valve Co., Ltd., of Nightingale Lane, Balham, were entertained by the directorate to commemorate the fourth anniversary of the firm. After dinner at Pinoli's, the assembled 14 adjourned to the Hippodrome, and thoroughly enjoyed the performance of "Leap Year." During the evening appropriate remarks were made by the managing director, Mr. S. R. Mullard, M.B.E., A.M.I.E.E., and Mr. C. F. Elwell, Fel.I.Rad.E., director, on the wonderful progress made by the company since its inception in 1920.

Russian Notes.—*Electrical Steel.*—An investigation of the situation of the Electric Steel Works has now been begun with a view to determining exactly the prime costs of production.

Standardisation of Equipment.—The works of the Central Electrical Trust and the Electrical Machine Trust are soon to begin the construction of new and improved types of machines. In this connection the General Electrical Commission has requested the two trusts jointly to work out standard types of generators, motors, transformers, &c., and as a consequence the engineers of the trusts will shortly meet to deal with the question.

Proposed New Hydro-Electric Works.—The State Planning Commission has had under consideration a report with regard to the construction of a hydro-electric works on the river Desne for the supply of the town of Kieff. It is estimated that the expenditure would amount to 7,000,000 roubles, whereas a steam power station of the same capacity would involve an outlay of only 2,000,000 roubles. The two proposals are now being submitted to the town of Kieff for decision, it being pointed out that it would be difficult to allot State funds in the present year in order to assist in the carrying out of either scheme.

Foreign Trading Credits.—A writer in a Moscow official newspaper, referring to the recent report that French firms have offered to grant long-term credits to Russia for works of electrification, alludes to the objections raised in some Soviet circles to the acceptance of such offers on the ground that manufactures supplied in the form of trading credits can already be produced at Russian works by the trusts. In the opinion of the writer, however, it would be a mistake to refuse such trading credits for the erection of generating stations and sub-stations as the establishment of the latter always creates a demand for motors and other plant and equipment, cables, apparatus and lamps of a value in excess of the value of the generating plant and consequently acts as a stimulus to the development of the production of subsidiary plant and apparatus in Russia.

An Electrification Fund.—The Supreme Council of National Economy has approved a scheme presented by the General Electrical Commission for the establishment of an electrification fund in connection with the inauguration of further regional generating stations and the shutting down of smaller stations. The machinery thus set free will be transferred to other undertakings and works so as to afford these a supply of electric power.

The Textile Industry.—The electrification of the textile mills in the region of Moscow is said to be hampered by the variation in the tariffs charged by the supply works. It is pointed out that the Schatur station charges from 3 to 5 copecks per kWh, the Moscow combination (Moges) from 3.5 to 10 copecks, and the Kaschir station from 6 to 7 copecks for power and 16 copecks for lighting purposes per kWh.

Telephonic Apparatus Developments.—At the electrical conference held in Leningrad in the last week in November it was stated that the Weak Current Trust had accomplished a large amount of work during the past year in freeing the telephone and telegraph industry from dependence upon other countries. Moreover, the trust is now beginning to enter foreign markets.

The Supply Industry.—Dealing with the extension of the work of electrification in Russia at the recent conference of the Association of Engineers in Moscow, Mr. M. K. Polivanoff is reported to have stated that according to the latest statistics, there were in operation 700 public utility stations and 4,200 isolated installations in industrial works and other establishments, the former representing 500,000 kW and the latter 1,000,000 kW, or a total of 1,500,000 kW. The general output ranged from 2,500,000,000 to 3,000,000,000 kW per annum. Coming to consider the electrification scheme for regional stations, it was pointed out that those of this type which have been built, or are in course of construction, comprise 150,000 kW, while the increase in the capacity of old stations and local stations will bring the figure up to 300,000 kW in 1927.

Aluminium Production.—Among the subjects discussed at the above mentioned conference was that of the production of aluminium, which was introduced by M. P. A. Palchin. Dealing with the question of providing the country with supplies of aluminium from its own resources in raw materials, the author mentioned that this metal was obtained exclusively from abroad at the present time, the pre-war imports having amounted to 800,000 poods per annum. The cost of aluminium over ten years ago was 20 roubles per pood, whereas it was now from 26 to 32 roubles per pood, including 6 roubles import duty. Aluminium production requires cheap electrical energy and the possession of good ore, and it is considered that the latter point has been radically solved by the investigations which have already been carried out by the Geological Committee, the Bauxite Committee and the Leningrad works. During 1924 M. S. F. Malyavkin, a geologist, investigated in the district of Tikivin the many deposits of bauxite and found, in three deposits, aluminium ore estimated to amount to 50,000,000 poods, including 20,000,000 poods of first-class ore corresponding, it is claimed, to the best French bauxite. These resources would afford a production of 500,000 poods of the metal for a period of 20 years. The same geologist also established the existence of similar deposits in the north extending over a distance of 40 versts. Having regard to the insignificant cost of the ore in relation to the cost of electrical energy, the whole problem is said to turn on the latter point, which can best be solved by a supply from the Dnieper station.

Book Notice.—"Cost of Power Production by Internal-combustion Engines." By G. A. Burls. Pp. 56; figs. 9. London: Blackie & Son, Ltd. Price 5s. net.

Broadcasting Increases Electric Lighting Demand.—Electric lighting undertakings in the United States are experiencing a heavier demand for current for lighting purposes, in consequence of the tendency of listeners-in to stay at home more in the evenings than formerly. It is expected that the sales of current for domestic lighting purposes in the United States are showing an increase of roundly two millions sterling per annum.

The British Industries Fair.—The Council of the Fair, which is to be held at Birmingham from February 16th to 27th, announces that space is being rapidly taken up, and acceptances of the invitations sent out have been coming in in satisfactory numbers. Many visitors saw the Fair for the first time upon their visit to England to inspect the British Empire Exhibition, and many of these have intimated their intention of visiting the Fair again this year. It is considered that the combining of the London and Birmingham sections has many advantages, particularly for those whose business gives them an interest in both branches. The City of Birmingham is to hold a Civic Week during the run of the Fair.

Electricity in Tin Production.—In the course of his speech at the annual meeting of Malayan Tin Dredging, Ltd., the chairman (Sir E. W. Birch, K.C.M.G.) said that the company had received a loan of £100,000 from the Trade Facilities Advisory Committee, and orders for new plant to the extent of £60,000 had been placed. The foundations for the power station were being prepared, and it was hoped to bring the power plant into service by next July. The power generated would be distributed by means of three or more overhead lines to the dredges, replacing the existing steam plant in operation there. The capacity of the plant would be ample for the company's requirements, with margin for probable extensions. The use of electricity would mean a great reduction in the fuel bill, which was the heaviest item of the company's expenditure.

Wages and Employment in November.—The monthly review of industry which appears in the December *Ministry of Labour Gazette* states that workers in the electrical cable industry, tramway employés in many centres, and employés of certain North-East Coast electricity supply undertakings received wage increases. Among the main groups of industry showing the number of persons engaged in them are: Electrical apparatus makers and fitters (not elsewhere specified), 164,199; gas, water, and electricity undertakings, 48,629; and transport and communication, 1,484,173. During November there was a slight decrease in unemployment in the electrical manufacturing and contracting industry.

Foreign Samples and Catalogues.—The Foreign Samples and Foreign Catalogues Section of the Department of Overseas Trade is being removed this week from 7, Old Bailey, E.C., to the headquarters of the Department at 35, Old Queen Street, Westminster, S.W.1. The exhibition will be re-opened at the new address on January 1st, 1925.

Polish Electrical Imports.—During July last Poland imported 1,035 metric tons of instruments, conductors, and other electrotechnical apparatus, valued at 2,183,000 zloty (£90,000 approx.).

United States Electrical Exports.—The export statistics of the United States for October last show that the value of electrical goods sent out exceeded the September total by $75,000, or 12 per cent.; the increase as compared with October, 1923, was 8½ per cent. Generating machinery and transformers showed substantial gains, but steam-turbine generator sets, although double in number those exported in September, were only half the value, indicating that business was done in very small units. The value of exported switchboards was less than half of the September figure, although 50 per cent. in advance of the October, 1923, total. Other classes of goods which showed increases as compared with September were motors, lamps, household appliances, radio equipment, and insulated copper wire and cables. Telephone exports showed a small decline.

Unemployment.—A total of 1,181,900 wholly unemployed persons was recorded at the Employment Exchanges on December 8th. This was 8,354 less than the previous week's figure and 103,723 less than on December 31st, 1923.

British Trade Mark Applications. — The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 10th, 1924. In the case of foreign applications, the names and addresses of the British representatives are also given.

Solodyne. No. 449,071. Class 8. Apparatus for use in wireless telegraphy and telephony. Tat. No. 451,647. Class 8. Apparatus for use in wireless telegraphy and telephony. Resistoflex. No. 449,446. Class 8. Wireless receiving sets.—J. Scott-Taggart, Devereux Buildings, Devereux Court, Strand, London, W.C.2.

Kylbro. No. 452,404. Class 8. Instruments and apparatus for use in wireless telegraphy and telephony.—Klein Bros., Ltd., 3, Norton Folgate, London, E.1.

Knivetown. No. 452,243. All goods included in Class 8.—F. Kniveton, trading as S. Corre & Co., importer and factor of wireless apparatus and batteries, 86, Rosebery Avenue, London, E.C.1.

Perfex. No. 453,304. Class 8. Apparatus for wireless telegraphy and telephony and parts thereof.—Wireless Apparatus, Ltd., 35, Panton Street, Haymarket, London, S.W.1.

Seagull (lettering and design). No. 453,106. Class 8. Instruments and apparatus and parts thereof for use in wireless telephony and telegraphy.—Seagull, Ltd., 21, Spital Square, London, E.1.

Amplion. No. 452,931. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes, but not including telephonic apparatus. Electravox. No. 452,934. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes. No. 452,936. Class 13. Electrically-operated motor or motor-cycle horns of ordinary metal.—E. A. Graham, trading as Alfred Graham and Co., Crofton Park Road, London, S.E.4.

Star of the North (lettering and design). No. 453,408. Class 8. Detector crystals for use in wireless telephony and telegraphy.—Wm. Jas. Shaw, 11, Walm Lane, Willesden Green, London, N.W.2.

Rayton. No. 453,179. Class 8. Headphones for wireless telephony and telegraphy.—S. Woolf, Leadenhall House, 101, Leadenhall Street, London, E.C.3.

Tapa (lettering and design). No. 448,295. Class 13. Plug and socket electrical terminals of ordinary metal.—W. J. Charlesworth, 88 and 89, Aston Street, Birmingham.

Weco. No. 452,414. Class 13. Metal goods not included in other classes.—Western Electric Co., Ltd., Aldwych, London, W.C.2.

Seecol. No. 452,987. Class 13. Electric lamps and lanterns used for stage and other lighting, electric battens and floats used for stage lighting, and fittings for said goods.—Strand Electric and Engineering Co., Ltd., 66a, St. Martin's Lane, London, W.C.2.

The date mentioned for the following applications is December 17th :—

M (lettering and design). No. 444,509. Class 8. Dials, graduated knobs, keys, receivers, head sets, variometers, and vario-couplers, all for use in wireless telephony; also various other electrical, telegraph, and telephone apparatus and parts.—Manhattan Electrical Supply Co., Inc., 17, Park Place, New York, U.S.A. (Fell & James, 11, Queen Victoria Street, London, E.C.4.)

Climax (lettering and design). No. 446,996. Class 8. Instruments and apparatus for use in wireless telephony and telegraphy.—Climax Patents, Ltd., 182, Church Street, Kensington, London, W.8.

Amplex. No. 450,641. Class 8. Wireless receiving sets, and parts thereof.—Collins & John, Ltd., 9 and 10, Tenby Street, Birmingham.

Polydor. No. 450,197. Wireless telephonic apparatus and parts and accessories therefor, &c.—Polyphonwerke Gesellschaft, 76, Markgrafenstrasse, Berlin, S.W.68, Germany (F. W. Golby, 3, John Street, Bedford Row, London, W.C.1).

Ampliola. No. 452,929. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes, but not including telephonic apparatus.—Edward A. Graham, trading as Alfred Graham & Co., Crofton Park Road, London, S.E.4.

The German Wireless Apparatus Trade. — Dealing in a Frankfort newspaper with the question of the economic importance of the radio industry, Dr. Arthur Hamm, of Charlottenburg, states that the big wireless exhibition which was recently opened in Berlin, presented for the first time a united demonstration of the technical efficiency of the German radio industry. The exhibitions held early this year at Leipzig, Berlin, Hamburg and Stuttgart, were poorly attended and were under the influence of a rapidly declining state of trade so that at these shows a real idea of German radio efficiency could not be obtained. From a technical point of view things were then in the development stage. It is stated that this has now been altered. The economic situation has hampered some operations and assisted others; prices have been greatly reduced until they now frequently approach the economic limit, while far more attention has been devoted to technical development and the trade has profited from the sharp criticisms levelled against former products. In conclusion, Herr Hamm states that special attention is now being paid to the improvement of the quality of the apparatus for the reproduction of music.

Electrical Trade Progess in South Africa.—A *Reuter Trade Service* dispatch from Cape Town stated, on November 28th, that the better tone prevailing in commercial circles at Cape Town had been fully maintained. Some of the engineering shops which had been slack were fairly busy. Imports of electrical material, agricultural implements and machinery, fencing wire, standards, &c., were increasing. There was a rush for wireless sets and nearly 2,500 had been sold in the Cape Peninsula and neighbouring districts. The dispatch added :—"A prominent feature in industrial development just now is the manner in which electrical power is being substituted for steam, and even oil power. This has led to a large call for electrical machinery and material and the demand for power has increased so rapidly in the Cape Peninsula that although the municipal power supply has been augmented by a 7,500 kW turbo-alternator an order for another is about to be placed. In fact, the demand for electrical power and light is rapidly increasing all through the Union and altogether there are a score or more of schemes either decided upon or under consideration and for which tenders are either being called or will soon be called. Owing to the big building contracts awarded and the plans passed, November has already made a record, the value of the work represented by the plans passed by the City Engineer's Department at Cape Town being about £425,000. The big contracts include the building of the post office annexe and buildings for milling companies."

Committee on Industry and Trade.—The seventh meeting of this Committee was held on December 17th, when Prof. D. H. Macgregor, M.A., Professor of Political Economy at Oxford, gave evidence. Prof. Macgregor considered that if combination and monopoly were to be allowed to continue to extend, there should be some method of economic control, such as that recommended by the Committee on Trusts in 1919. In dealing with the settlement of wage claims, Prof. Macgregor considered that it would be advantageous for employers to promise that if arbitration was resorted to instead of strikes, any award made would be antedated to the time of the institution of the inquiry; or, alternatively, that the trade union concerned could be authorised to advance to its members in whole or part the advance claimed, on a guarantee that it would be reimbursed in whole or part if a favourable decision were obtained.

New Australian Company.—Among the companies recently registered in New South Wales was Electrice, Ltd., formed with a capital of £100,000 to carry on the business of machinery manufacturers and civil, mechanical, and general engineers.

The Melbourne Electric Supply Co.—On October 22nd last the Premier introduced into the Victorian Legislative Assembly a Bill to extend the franchise of the company for 10 years, with an option of the Government's acquiring the undertaking at the expiration of 5 years or 7½ years. The Bill further provided for a limitation of profits and for price control. The Premier said that it was estimated that the company would have to spend at least another £800,000 before its existing term came to an end, and this would bring the total value of the assets to about £4,000,000. The company had agreed in principle to the fundamental conditions of the extension, which were :—The Government to have the option of purchase as above-mentioned, and, in certain circumstances, the company to be able to call upon the Government to take over the undertaking at the end of five years; acquisition, when effected, to be based upon the "residual" value of assets less depreciation at an average of 3 per cent. per annum; the distributable profits to be limited to 7 per cent. per annum upon the ordinary capital and to 8 per cent. on the 8 per cent. preference capital; the company to carry out works of improvement and extension as required by the Government, and to purchase all its requirements of power from the State; and the company not to issue further capital except with the approval of the Government. Thus the company would become, in effect, the manager of the undertaking under the control of the Government.

The Bill passed through all its stages with only one minor amendment.

Indian Electrical Trade Increasing.—In the course of a dispatch, dated November 29th, from Bombay, *Reuter's Trade Service* refers to the signs which have begun to appear of a revival in general trade and states that a demand for wireless listening-in sets has sprung up. "India presents unlimited scope for the development of wireless telephony, but unfortunately the prices asked for sets are still too high, being beyond the means of many." The dispatch continues :—"The demand for the best type of electrical goods is surprisingly increasing with the development of town electrification projects. In this the British manufacturer has the advantage over many of his competitors who are selling cheap and usually inferior apparatus. Domestic installations with the latter class of goods have proved by no means economical and many Indian customers are now insisting on British goods. There appears to be room for the representation of a good many more British electrical firms in India."

Swedish Engineering Industries.—*Ekonomisk Oversikt* states that employment in the engineering industries, which on July 1st had reached its maximum after the period of depression, again shows a decrease, the number of workers employed on October 1st being 39,480, a decrease of 450 at the shipyards and 850 at the mechanical workshops. The decrease at the shipyards is seasonal, while that in the mechanical workshops is chiefly due to the absence of new Russian orders for locomotives. The electrical industry has increased its employés by 340 in consequence of orders placed by the Swedish railways, but it is still suffering from keen German competition. The situation in all the engineering industries is considered unpromising, and orders are becoming scarcer and foreign competition more troublesome.—*Reuter's Trade Service* (Stockholm).

German Import Restrictions Removed.—Among the articles recently placed on the list of goods which may be imported into Germany without licence are electric arc lamps, mercury-vapour lamps, quartz lamps, and other similar lamps.

Destruction of Swedish Electrical Works.—On December 14th a fire occurred at the works of the Ecks Electrical Co., at Partille, Gothenburg, causing damage estimated at £100,000.

Social Events.—Over 200 members of the M.E.M. Social and Athletic Club attended the Club annual dinner and concert at Birmingham on Friday last. The whole of the programme was provided by members of the works and office staff of the company (the Midland Electric Manufacturing Co., Ltd.).

A successful fancy dress carnival and dance was held by the Social Club of the County of London Electric Supply Co., Ltd., at Cannon Street Hotel on Friday evening last. The costumes were of pleasing and original design, and a number of prizes were awarded for those adjudged the best. Novelties were numerous, and the excellence of the dance music, provided by Bert King's Syncopated Orchestra, greatly added to the enjoyment of the dance, which was attended by about 300 of the staff and friends.

Electrical Industry in the U.S.A.—Information regarding the position of the electrical industry in America may be gathered from a statement published in the *Electrical World* for December 6th. The General Electric Company has recently appropriated $3,500,000 for manufacturing stock to lessen unemployment. Mr. Gerard Swope, president of the company, has made the following statement to our contemporary:—

"During this year the orders of the General Electric Company decreased from $71,220,000 in the quarter ended June 30th to $58,390,000 in the quarter ended September 30th. To ameliorate the condition incident to the laying off of a large number of old and valued employés, the company authorised the placing of orders on the factory in the amount of $3,500,000, this apparatus to be manufactured during the period of diminished business and put in stock. This appropriation applies to all the plants of the company producing apparatus that can be stocked and for which there will be a demand as business revives. This will not only have the effect of keeping more of our men employed, but will also place the company in a position to serve its customers better."

Lighting and Power Notes.

Alloa.—PROPOSED SALE OF UNDERTAKING.—The Town Council has decided to delay until May next a recommendation by the Electricity Committee that negotiations should be continued with the Scottish Central Electric Supply Co. for the sale of the Council's electricity undertaking. At May of this year the accumulated losses of the undertaking amounted to £38,700. Arguments in favour of delay were brighter prospects and the probability of the undertaking being taken over by the Government.

Australia.—HUME RESERVOIR.—The Federal, Victorian, South Australian, and New South Wales Governments have approved the proposals of the recent conference regarding the construction of the base of the Hume reservoir to the full extent of 2,000,000-acre ft. The resolutions of the conference, which have been approved by the above Ministries, were that provision should be made for outlet works at the Hume reservoir suitable for hydro-electric generation, and that the cost of such additional works, estimated at £40,000, should be borne in equal shares by the Governments of New South Wales and Victoria, which Governments should have the sole use of any power generated at the reservoir.—*Reuter's Trade Service* (Melbourne).

Aylesbury.—SPECIAL ORDER.—The Electricity Commissioners have made a Special Order authorising the Town Council to supply electricity to parishes in the rural areas of Aylesbury, High Wycombe, Tring, and Berkhamsted, and in the urban districts of Thame and Tring.

Battle.—ELECTRICITY SUPPLY.—The Urban District Council has sealed an agreement for an electric lighting scheme by the Southern Counties' Electric Light & Power Supply, Ltd.

Bideford.—SPECIAL ORDER.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation an Order made by them authorising the Bideford & District Electric Supply Co., Ltd., to supply electricity in the boroughs of Bideford and Great Torrington, the Urban District of Northam, and parts of the Rural Districts of Bideford, Barnstaple, and Torrington.

Brighton.—LOAN SANCTIONED.—The Corporation has received sanction to the borrowing of £58,936, on account of an application for £76,747, for the following purposes:—Buildings, £12,800; mains, £23,000; plant, £23,136.

Bradford.—EXTENSION OF SUPPLY.—The borough electrical engineer (Mr. T. Roles) has prepared a scheme for the supply of electricity in Clayton at an estimated cost of £11,000. If a satisfactory arrangement is made with the Yorkshire Electric Power Co., the scheme will be submitted to the Electricity Commissioners for sanction. Meanwhile the Corporation is applying for a Special Order authorising it to supply electricity in the area.

Continental.—FRANCE.—A new hydro-electric plant to utilise the water power of the River Herault, in the Department of that name, was recently inaugurated. The work has been carried out for the Co-operative Agricole d'Electricité de St. Martin, of Bertrand. The plant at the power station, which is supplying energy to 52 communes in the district, comprises three 700-kW turbo-alternators. The current is stepped up for transmission purposes to 13,500 V, the pressure being reduced to 110-190 V at small transformer stations established in the villages supplied. Altogether about 160 miles of h.p. distribution mains has been established.

THE TYROL.—The Tiroler Wasserkraftwerk Gesellschaft, of Innsbruck, is increasing its capital from 20 to 30 million kronen to enable it to proceed with the construction of the hydro-electric plant which is to be established at Jenbach, in the Tyrol, to utilise the water power of Lake Achen.

POLAND.—The new central power station which is being established at Plotrkow by a Belgian undertaking, the Société des Entreprises Electriques en Pologne, is rapidly approaching completion, and is expected to be put into operation early in the New Year.

Conisborough (Yorks.).—ELECTRICITY SUPPLY.—The Urban District Council has requested the Electrical Distribution of Yorkshire, Ltd., to give early attention to the provision of mains, &c., for the lighting of the streets of the Conisborough Housing Association scheme, and to submit details and estimates for the work. It has also decided to ask the Yorkshire Electric Power Co. to supply electrical energy to the plant at the reservoir.

Dalbeattie.—STREET LIGHTING.—The Town Council has approved a scheme submitted by the recently-established Electric Lighting Co. for the lighting of the streets by electricity in place of the present gas lamps. Most of the private houses and business premises in the town have been fitted for electric lighting.

Grays.—LOAN SANCTIONED.—The Urban District Council has received sanction to a loan of £4,100 for cable extensions, &c.

Hawaiian Islands.—HONOLULU.—The Hawaiian Electric Co., which supplies electricity to Honolulu and the plantations of Oahu, is to install three new sets, with an additional capacity of 50,000 h.p.

Horwich.—INAUGURATION OF SUPPLY.—The first supply of electricity was received at the Lynde Street station at Horwich from the Lancashire Electric Power Co.'s generating factory at Radcliffe on December 18th. The machinery was set in motion by the chairman of the Electricity Committee.

Hoylake and West Kirby.—NEW PLANT.—The Urban District Council has recently put a new generating set into commission. It is similar to the one installed thirteen years ago, which has been found inadequate to cope with the growing demand. The new plant includes condenser, cooling tower, and boiler. At the inaugural ceremony it was stated that in 1902, when the electricity undertaking was inaugurated, the Council had 275 costomers; now it had 2,230, and a plant capacity of 1,425 kW, against 375 kW twenty years ago.

Irish Free State.—LIFFEY SCHEMES INQUIRY.—During the further consideration by the Free State Joint Parliamentary Committee of the Dublin Electricity Supply Bill, Sir John P. Griffith, the chief promoter, was examined. He estimated that the River Liffey, under the scheme submitted in the Bill, would be able to supply all the needs of Dublin and district, making ample provision for generating and transmitting losses. The total available power was estimated at 50,784,200 kWh per annum. The gross cost of the entire scheme would be £1,168,000, which included £161,116 interest during the four years of construction. Dr. Jeffcott, supporting the scheme, said that the gross imports of coal into the whole of Ireland were about 4¼ million tons per annum, and of that about

two-thirds would be for power purposes. Mr. Wm. Cash, principal of Cash, Stone & Co., accountants, London, expressed the opinion that this Bill went further than any other scheme he had seen in the direction of giving to the consumer the benefit of any lessening of the cost of production resulting from extensions of the supply. Herr Buchi, the Swiss expert, who reported to the Dublin Corporation on the potentialities of the River Liffey, next gave evidence. He stated that his report was prepared on conservative lines. The cost of production of electricity might not be exactly as anticipated owing to things they could not foresee. He entered on an examination of the technicalities of the Corporation scheme (which is to be considered by the Committee at a later stage) and compared it in certain aspects with the rival scheme.

The Committee's sittings were continued this week.

London.—STOKE NEWINGTON.—The Electricity Committee has recommended to the Borough Council that the following work be carried out under the hire-purchase system:—Wiring of consumers' premises, £500; supply of electric cookers and heaters, £300.

Application is being made for sanction to the borrowing of £10,000 for mains and services, and £2,000 for meters.

HAMMERSMITH.—The Electricity Committee has received a report from Mr. J. H. Rider, consulting engineer, dealing with the extension of boiler house plant, in which he recommends that a 45,000- to 50,000-lb. boiler with automatic stokers be installed in lieu of the Davey-Paxman boilers, Nos. 8, 9, and 10, which are no longer in commission.

ST. PANCRAS.—The Borough Council has received sanction to the borrowing of £43,000 for the installation of a 10,000-kW turbo-alternator at King's Road power station.

Lowestoft.—PROPOSED BULK SUPPLY.—The Corporation has instructed the general manager to make inquiries of the Corporations of Norwich and Great Yarmouth as to whether they would be prepared to supply electricity in bulk to the Corporation.

New Zealand.—DUNEDIN.—The accounts of the City Council's electricity undertaking (engineer: Mr. M. C. Henderson) for the year ended March 31st last show a total revenue of £120,888, as compared with £115,748 in the preceding year. Working expenses absorbed £46,347, as against £37,397, leaving a gross profit of £74,541 (£78,368). After deducting capital charges there was a net surplus of £17,636, as compared with a surplus of £27,288 in 1922-23. A total of 21,701,942 kWh was sold, as against 20,092,361 kWh in the preceding year, and the connections increased from 24,737 to 26,698 kW. The maximum supply demanded rose from 7,070 to 7,360 kW.

Northern Ireland.—LURGAN (CO. ARMAGH).—In furtherance of the scheme for the electric lighting of Lurgan, the Town Council has held a consultation with Mr. Pleasance, the engineer, who explained the details of the scheme, and estimated the cost of the undertaking to be about £11,000. Further consideration was adjourned.

DONAGHADEE (CO. DOWN).—The Urban District Council is applying to the Ministry of Commerce for an extension of one year for carrying out the Donaghadee Electricity Order, 1911.

Preston.—ELECTRICITY ORDER.—The Town Council is applying for an Order authorising it to extend its area of electricity supply so as to include the Urban District of Leyland.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

LONDON.—*City of London Electric Lighting Co., Ltd.*—Lighting: For the winter quarters 6d. per kWh for the first 7 kWh per 30 watts connected, for the summer quarters 6d. per kWh for the first 3 kWh per 30 watts connected, and 4d. per kWh for all energy consumed per quarter in excess of such quantities. Power: 1d. per kWh, plus a fixed charge of 10s. per quarter per kW of connected demand. Heating: 2d. per kWh.

TYNEMOUTH.—Lighting: Flat rate from 5¾d. to 5¼d. per kWh. Net rateable value system: The kWh charge reduced from 1¼d. to 1d. To tariff consumers the following optional "residential tariff" is proposed: 1s. per room per month during the winter months, and 2s. per room per month during the summer months, plus 1d. per kWh consumed. No meter rent to be charged, and accounts to be subject to a discount of 5 per cent.

RADCLIFFE.—Domestic heating: A flat rate of 1d. per kWh.

WHITWORTH.—Lighting: 6¼d. per kWh. Power for domestic purposes: First 300 kWh per quarter, 1¼d. per kWh; all energy in excess of this amount, 1¼d. per kWh.

Radcliffe.—LOAN SANCTIONED.—The Urban District Council has received sanction to the borrowing of £17,593 for plant, sub-stations, and mains.

Slaithwaite.—INAUGURATION OF SUPPLY.—The Urban District Council's electricity undertaking was formally inaugurated on December 16th. Electricity is obtained in bulk from the Yorkshire Electric Power Co., and distributed by the Council. An exhibition of electrical appliances was also opened on the same day.

Southam.—OPPOSITION TO ORDER WITHDRAWN.—The Rural District Council has decided to withdraw its objection to the Southam and District Electricity Special Order, and to give consent to the application.

South Shields.—YEAR'S WORKING.—The report on the working of the Corporation's electricity undertaking (engineer: Mr. J. Edgar) for the year ended March 31st last shows a total revenue of £84,558, as compared with £86,139 in the previous year. Working expenses amounted to £44,956, as against £41,944, leaving a gross profit of £39,602 (£44,195), to which was added interest on investments, making a total of £41,612. After deducting capital charges and expenditure charged to net revenue account, there was a net surplus of £7,774, as compared with £7,997 in 1922-23. During the year £41,110 was spent on capital account, the main items being £11,730 for buildings, £15,444 for machinery, and £10,210 for mains. The sales of electrical energy increased from 7,262,586 to 7,717,158 kWh, and the average price obtained per kWh fell from 2.72d. to 2.52d.

Stockton-on-Tees.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £6,500 for extending the electricity supply to the Oxbridge district and £2,760 for extensions to the Norton district.

Tynemouth.—ELECTRICITY SUPPLY.—The Corporation has received a request from the Tyne Commissioners for a quotation for a supply of electricity to the Docks area on a five-years' agreement. The electrical engineer states that the bulk supply agreement will terminate in 1927, and the Corporation has instructed him to obtain from the Newcastle Electric Supply Co. terms for an extension of the agreement.

LOAN.—Application has been made for sanction to borrow £15,000 for electricity extensions.

Weardale.—ELECTRICITY SCHEME.—The Rural District Council is considering a scheme for supplying the valley with electricity. The electrical engineer has submitted a report which estimates the cost at £29,080, with an additional £5,000 to cover the cost of overhead lines, transformer, switchboard, &c., if power supplied by the company operating in Durham is used. The matter has been referred to a special committee.

Weymouth.—LOAN.—The Corporation is applying for sanction to borrow £2,000 for mains and services.

Wokingham.—ELECTRICITY SUPPLY.—The York Town and Blackwater Gas Co. has applied to the Town Council for its consent to an application for a Special Order to supply electricity within the borough. The Council has appointed a committee to consider the question.

West Indies.—PORTO RICO.—The Hydroelectric Co., of Ponce, has applied to the local Public Service Commission for a licence. If this is granted it will ultimately involve the construction of three or four power stations.—*Commerce Reports.*

Tramway and Railway Notes.

Bradford.—TRAMWAY FARES.—The City Council, at its adjourned meeting on December 16th, held specially to consider the introduction of penny tramway fares in January and the position of the existing cheap weekly and transferable passes, decided to approve the penny fares but to disapprove of the Tramways Committee's proposal to discontinue the passes.

Chile.—SANTIAGO.—According to *Commerce Reports*, a decree has been issued by the Ministry of the Interior granting permission to a Santiago engineer to construct a subway traversing the streets of Santiago. The concession is for a period of 20 years, and, among other conditions, that one section, the line under Alameda de las Delicias from the Plaza Italia to Plaza Argentina, a length of about 1¼ miles, is to be completed within a period of five years. The estimated cost of this section is 60,000,000 paper pesos.

Edinburgh.—PROPOSED NEW ROUTE.—The tramway manager has been instructed to report upon a proposal to lay a tramway along East Prewton Street and Dalkeith Road to Cameron Toll.

Keighley.—RAILLESS CARS.—Railless cars have now superseded trams on the whole of the Keighley Corporation tramway system, the last of the three routes having been converted. Double- and single-deck vehicles of the Straker-Clough type, with bodies by the Brush Electrical Engineering Co., have been put into service. The conversion has been carried out without any interruption of the service. The rails have been removed and the road reinstated on the Utley route. The rails are being taken up on the Stockbridge route, and it is hoped that before spring the whole of the work will have been completed. The double-deck vehicles carry 50 passengers, and the single-deck vehicles are intended for one-man operation during the quieter times of the day.

NEW CARS.—The Tramways Committee is seeking sanction to purchase four more double-deck railless cars from Messrs. Clough, Smith & Co., Ltd., at an estimated cost of £8,500.

London.—PROPOSED TRAMWAY LINK.—The *Daily Telegraph* states that the London County Council is seeking the permission of the City Corporation to lay an unelectrified single line in Farringdon Street and New Bridge Street, between the existing tramways in Farringdon Road and those on Blackfriars

Bridge, in order that the Council's double-deck tramcars on the Northern system may be transported to the repair depôt at Charlton. The line would be used solely for the transfer of cars by haulage from the Northern to the Southern system, and only at night or within such specified times as the Corporation might fix.

Southern Railway.—ELECTRIFICATION.—A recent report upon the progress of the electrification of the South-Eastern section of the system indicates that 180 miles of conductor rail has been laid, while about 200 miles of running track has been bonded and 50 miles of high-pressure cables laid. A repairing shed, which will be the main depôt for the electrical stock, is being erected at Slades Green. On the South-Western section work is proceeding rapidly in the electrification of the Dorking and Guildford lines.

Swansea.—INQUIRY.—On December 16th Mr. C. R. Kerwood, of the Ministry of Health, held a local inquiry into an application by the Swansea Corporation to amend its Acts of Parliament so as to enable it to advance the Swansea Improvements and Tramways Co. moneys from time to time for tramway track renewals, &c. Mr. David James, J.P., managing director of the company, supported the Town Clerk in the application, and it was stated that the advances would be repayable with interest before December 31st, 1942, at which time the Corporation had the right to take over the whole of the tramway undertaking. During the past three years nearly £80,000 had been spent by the company on improvements and renewals, and that for the current year the expenditure was £45,000. There was no opposition to the application, and the Inspector's report will be received in due course.

Woverhampton.—PURCHASE OF TRAMWAY.—The Town Council has confirmed the purchase of such portion of the Wolverhampton and Dudley tramway within the urban districts of Sedgley and Coseley as is situate in the main road from Wolverhampton to Dudley on the terms contained in the recent report of the Tramways Committee.

Telegraph and Telephone Notes.

Continental Telephony.—LONG-DISTANCE SERVICES.—There is now direct telephonic communication between Vienna and Rome (410 miles), *via* Trieste. The charge for a three-minutes' conversation is 5s., and for an urgent conversation thrice this rate, says the *Evening News*. Rome is also in direct communication with Paris (700 miles), *via* Switzerland, and in a few weeks Vienna and Paris (670 miles) will also be directly connected.

The new direct telephone line between London and Berlin *via* Emden was tested during the night of December 16th-17th for the first time by the London General Post Office. The correspondent of a Berlin newspaper in London was able to telephone a long article to his Berlin office, which was successfully taken down, only two words being incomprehensible. It is stated in Berlin that the experiments will be continued and the line possibly opened for public use next year.—*Reuter* (Berlin).

ENGLAND-HOLLAND SERVICE.—Four out of the twelve circuits provided on the recently-laid telephone cable from England to Holland are now in operation. Two of them are working to Amsterdam and two to Rotterdam. The opening of the remaining eight is delayed until the Dutch authorities provide the necessary land-lines. When these are ready—some time early in the New Year, it is hoped—direct telephone communication will be available between London and almost all parts of Holland, possibly also to Hamburg. Direct communication with Berlin, however, is not likely until another cable is laid. It was understood that the Dutch Government was prepared to bear its cost, but difficulties have arisen and the matter is still under negotiation.—*Evening News*.

The Telephone Service.—FRANKLIN EXCHANGE.—A new exchange named Franklin is being discovered by users of certain lines formerly attached to the Victoria (London) exchange. It is housed in the same building at Westminster, and its operators use an extension of the Victoria switchboard. In a few months, however, new and permanent exchanges are to be opened in the neighbourhood. Franklin came into being a short time ago because the Victoria exchange, which has more than 10,000 lines, was full.—*Daily Mail*.

DEVELOPMENT ASSOCIATION.—A deputation from the Telephone Development Association, which was received on December 18th by the P.M.G., Sir William Mitchell-Thomson, and Viscount Wolmer, M.P., at the General Post Office, was introduced by Sir Alexander Roger, chairman of the Association, supported by Mr. Hugo Hirst, Sir George Sutton, Bart., Mr. Frank Gill, and other members of the Council of the Association. The general purpose of the deputation was to invite the Postmaster-General's official approval of views on telephone development which had already been submitted to him in the form of a memorandum. The deputation further urged the advisability, in the interests of national efficiency and employment, of the Government adopting a forward and continuous policy of telephone construction, extending over a period of at least 15 years.

The Telegraph Service.—TELEPHONE DELIVERY.—The General Post Office has announced that during the Christmas holidays the Central Telegraph Office is making arrangements for the delivery of telegrams by telephone over an extended area. A wider use is being made of the telegram-telephone service, and it is computed by *The Times* that after the closing of telegraph offices some 80 per cent. of the telegrams received at the Central Telegraph Office can now be delivered by telephone within a radius of approximately 60 miles.

Radio Notes.

Broadcasting in Schools.—L.C.C. DECISION.—At a meeting of the London County Council Education Committee, on December 17th, an urgency report was presented by the Elementary Education Sub-Committee. After consideration it was decided that the installation of radio receiving apparatus in public elementary schools should be permitted for purposes of the curriculum, provided that the liability of the Council was limited to the payment of the fees for the annual licence. It was further decided that where such apparatus was installed solely for purposes of recreation outside school hours no liability should be incurred by the Council. It was stated that about 130 schools had receiving sets as part of the science and handwork scheme, and that during the current year the Council had spent £25 in annual licences. Children were taught how to make and assemble the parts necessary for the reception of telegraphy and telephony. The use of the apparatus helped to associate science more clearly with modern progress, and stimulated a healthy activity which continued after school hours, thus quickening interest in school matters on the part of parents.—*The Times*.

Canada.—RAILWAY BROADCASTING.—The Canadian National Railways have provided, between the Pacific and Atlantic, ten broadcasting stations; receiving sets are provided at cost price for the railwaymen, who number about 100,000, and it is hoped that by means of the new station at Moncton, New Brunswick (CNRA) passengers who now listen to the local stations while travelling in Canadian express trains will be able to hear English programmes as well.

Italy.—INCREASED CAPITAL.—Several Italian companies interested in broadcasting are about to increase their issues of capital stock, according to *Commerce Reports*. The Società Anonima Radiofono is to increase its capital from 100,000 to 6,000,000 lire. Similar increases are: The Società Anonima Radioaraldo of Rome from 1,000,000 to 1,600,000 lire, and the Società Italiana Radioaudizioni Circolari of Milan from 100,000 to 1,500,000 lire.

Latvia.—BROADCASTING STATION.—A contract for the construction of a broadcasting station at Kovno has been granted to a French firm, says *Commerce Reports*.

Foreign Apparatus.—EMBARGO REMOVED.—The period during which it was agreed between the B.B. Co. and the Post Office that the radio industry was to be protected against competition from the Continent—particularly Germany, where wages are very low—expires at the end of this year. The General Post Office states that after January 1st radio receiving licences will not contain the clause stipulating that sets or components used in this country must not be of foreign manufacture. The reasons that have impelled the Postmaster-General, Sir William Mitchell-Thomson, to reach this decision were stated to the *Daily Mail* by a Post Office official to be: "The Postmaster-General does not consider that he can defend any attempt to afford protection to British apparatus by the licensing system or otherwise than as part of the general fiscal system of the country." It was explained that the protection was afforded for a limited period to help a young industry in making a start.

United States.—MINE RESCUE WORK.—Experiments on underground reception of surface broadcast radio signals, for the purpose of developing a super-sensitive underground radio receiving set to be used in mine rescue work, were conducted with excellent results at the Pittsburgh station of the Bureau of Mines during the recent transatlantic tests. A Government station in a cellar was used, and loud-speaker reception of several English and Continental stations was reported. Two sets were used, one being of the superheterodyne type and the other having a 50-ft. antenna. Mr. Jahosky, the Government radio engineer in charge of the experiment, says he is now working on a radio set suitable for use in mine rescue work.—*Reuter* (Pittsburgh, Pa.).

New Zealand.—LICENSING RADIO DEALERS.—A Bill providing for the licensing of radio dealers and the application of a portion of the fees thus collected to the assistance of broadcasting agencies has been introduced in the New Zealand Senate. Arrangements have already been made for the formation of a company to operate 400- and 500-watt stations, one in each centre, but further progress is impossible until the legislation is passed.—*Commerce Reports*.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

Open.

Ashford (Kent).—December 24th. Urban District Council. Three 500- to 600-b.h.p. vertical-cylinder heavy-oil engines for the Electricity Department. 15,000 yards l.p. distributor cable, 12,000 yards e.h.p. feeder and 5,000 yards service cable. (December 12th.)

Australia. — MELBOURNE. — January 13th. Postmaster-General's Department. Telephone indicators and induction coils and registers. January 20th. Condensers. January 21st. Automatic telephone switchboards. (November 28th.)

February 3rd. Generators, switches and resistances, reactances and telephone parts, switchboard keys and switchboard jacks. February 10th. Pedestal and hand sets. April 21st. Automatic telephone switchboards and associated apparatus.

February 2nd. State Electricity Commission of Victoria. 22,000-V transformers and spares.

SYDNEY.—February 11th. New South Wales Government Railways. Two lighting storage batteries. February 4th. Two motor-driven air compressors. February 18th. Four 3-phase, 25-cycle, 500-kVA transformers.—*Reuter's Trade Service* (Melbourne).

January 27th. Sydney Municipal Council. High-pressure oil circuit breakers.

February 4th. Public Works Department. Two motor-driven self-cleaning water screens.*

Barnes.—January 12th. Electricity Department. One 500-kW rotary or motor-converter, with transformer and switchgear. (December 19th.)

Belgium.—December 29th. Belgian State Railway authorities (Office de l'Electricité), 25, Rue de la Charité, Brussels. Armoured cable, terminal boxes, junction boxes, and insulating material. Particulars on application to Cahier des Charges Special No. 4-40.

Bournemouth.—January 9th. Corporation. Wiring, &c., for electric lighting at the Sanitary Hospital, Gloucester Road. (See this issue.)

Cardiff.—January 19th. Electricity Department. One water-tube boiler with mechanical stoker, one 320-tube economiser, and one chimney cooling tower complete. (December 19th.)

Dartford.—January 17th. Electricity Department. Extensions to the electricity department, including artesian well, 750-kW rotary converter and e.h.p. and d.c. switchgear. (See this issue.)

Egypt.—CAIRO.—January 6th. General manager, Egyptian State Railways. Telegraphs and telephones, Cairo station. Supply of transformers, switchgear, and cables. Specification from the Stores Department, Saptia (Cairo) or Gabbary (Alexandria).

December 30th. Secretariat of the Municipality of Béni-Souef. Supply of electrical material necessary for the electrical installation of the town.—*Reuter's Trade Service* (Cairo).

France.—January 3rd. Le Syndicat Intercommunal du Department des Deux-Sevres pour le Distribution de l'Energie Electrique, 4, Rue de la Prefecture, Niort. One 30,000/15,000-kVA transformer.

Glasgow.—January 13th. Corporation. Electric lighting, bells, telephones, and fire alarm installations in connection with the erection of the sanatorium at Mearns, Renfrewshire. Specifications from Office of Public Works, 64, Cochrane Street.

January 6th. Electric lighting installation in connection with the Balmoral Street, Scotstoun, and West Craigton housing schemes. Specifications, &c., from Mr. R. B. Mitchell, 75, Waterloo Street, Glasgow.

Guildford.—January 9th. Board of Guardians. Electrical wiring and fittings for the Infirmary Children's Home, &c. (December 12th.)

Horsey.—January 15th. Electricity Department. Battery regulator and electrical control for the generating station. (See this issue.)

India.—BOMBAY.—February 24th. Bombay, Baroda, and Central India Railway Co. Electrification of Bombay suburban lines: Sub-station and track sectioning switchgear and accessories, rotary-converter sets and transformers; or, alternatively, automatic sub-stations, sub-station equipments and track sectioning switchgear. (December 12th.)

January 20th. Impedance bonds for track circuiting. (See this issue.)

January 2nd. India Store Department. Electric cells for railway carriages. (See this issue.)

London.—CAMBERWELL, S.E.—January 12th. Borough Council. Six or 12 months' supply of electric lamps. Maintenance of electric lighting, heating and power installations, telephones, &c., for 12 months. Forms of tender from Mr. W. Bell, borough surveyor, Town Hall, Camberwell Green.

LONDON COUNTY COUNCIL.—January 19th. 3,700 tons of standard steel girder tramway track rails, lipless track rails and fishplates, and, alternatively, 4,700 tons of such rails and bolts; 700 tons of conductor tee rails. Chief Engineer, Old County Hall, Spring Gardens, S.W.

Manchester.—January 3rd. Electricity Committee. 62 electric wash boilers. (See this issue.)

Ormskirk.—December 27th. Board of Guardians. Wireless installation at the Institution, and, alternatively, for the provision of loud speakers in one, three, and six wards, controlled by a central switchboard; also for the installation of approximately six aerials with one or more receiving sets, as may be required. Particulars from the Master, 74, Wigan Road, Ormskirk.

Sheffield.—January 3rd. Electricity Department. Materials and works for three transformer sub-stations. Mr. S. E. Fedden, manager, Electric Supply Department.

South Africa.—JOHANNESBURG.—January 17th. Municipal Council. Traction-testing panel, tramway motors and spares, electric cable.*

Stoke-on-Trent.—January 14th. Electricity Department. L.p. switchgear. (December 12th.)

Uruguay.—MONTEVIDEO.—February 12th. State Electricity Works. 104,500 metres of rubber-insulated cords.*

February 13th. Lubricating oils.*

February 16th. Copper wire and cable.*

February 17th. 745,000 metres of special cables for outside use under inclement conditions. (Hackethal type).*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Aldershot.—Education Committee. Accepted:—
Wiring West End Schools for electric light (£90).—Mr. A. Sutton.

Argentina.—Buenos Ayres Central Argentine Railway Co., Ltd.
Power signalling apparatus at Retiro terminal station and yard.—British Power Railway Signal Co., Ltd.—*Modern Transport.*

Bexhill.—Electricity Committee. Recommended:—
2,500 yd. cable (£558).—Enfield Cable Works, Ltd.

Exeter.—St. Thomas Board of Guardians. Accepted:—
Electric lighting of the institution (£237).—Hubber & Sons, Exeter.

Faversham.—Town Council. Accepted:—
Pipe work at the electricity works (£233) and an overhead tank (£90).—Semark, Ltd.

Government Contracts.—The following Government contracts were placed during November, 1924:—

ADMIRALTY CONTRACT AND PURCHASE DEPARTMENT.

Turbo-alternators.—Fraser & Chalmers Engineering Works, Ltd.
Water-tube boilers.—Stirling Boiler Co., Ltd.
20-ton electric capstans.—Cowans, Sheldon & Co., Ltd.
Cells.—London Battery & Cable Co., Ltd.
Electric travelling crane.—Marshall, Fleming & Co., Ltd.
Electrodes.—Quasi-Arc Co., Ltd.
Electric lamps.—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.
Electric locomotive.—British Electric Vehicles, Ltd.

WAR OFFICE.

Generating sets and spares.—Blackstone & Co., Ltd.
Electric locomotive.—R. & W. Hawthorn, Leslie & Co., Ltd.
Secondary battery.—Pritchett & Gold and E. P. S. Co., Ltd.
Electric light installation.—Guildford: Alpha Electric Mfg. Co., Ltd.

AIR MINISTRY.

Battery locomotives.—J. Booth & Bros., Ltd.
Repair of magnetos.—North & Son, Ltd.
W/t apparatus.—C. A. Carter & Co., Ltd.; Gambrell Bros.; H. W. Sullivan, Ltd.

POST OFFICE.

Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; Brit. L. M. Ericsson Mfg. Co., Ltd.; British Insulated & Helsby Cables, Ltd.; General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.; Sterling Telephone & Electric Co., Ltd.; Telephone Mfg. Co., Ltd.; Western Electric Co., Ltd.
Testing and protective apparatus.—Automatic Telegraph Mfg. Co., Ltd.; General Electric Co., Ltd.; W. Jones & Co.; Phœnix Telephone and Electric Works, Ltd.; Siemens Bros. & Co., Ltd.; Edison Swan Electric Co., Ltd.
Wireless apparatus.—Creed & Co., Ltd.; Dubilier Condenser Co. (1921), Ltd.
Coin-collecting boxes.—Hall Telephone Accessories, Ltd.
Cable (various).—British Insulated & Helsby Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; General Electric Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Macintosh Cable Co., Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.
Joint-box castings.—United Steel Cos., Ltd. (T. Butlin & Co.).
Loading coils.—Western Electric Co., Ltd.
Conduit and fittings.—General Electric Co., Ltd.
Cords for telephones.—London Electric Wire Co. & Smiths, Ltd.; Phœnix Telephone & Electric Works, Ltd.; Ward & Goldstone, Ltd.; Western Electric Co., Ltd.

Ducts.—Albion Clay Co., Ltd.; Candy & Co., Ltd.; Donington Sanitary Pipe & Firebrick Co., Ltd.; Doulton & Co., Ltd.; G. Jennings.
Desiccators and pumps.—S. Smith & Sons (Nottingham), Ltd.
Electric light fittings.—Cable Accessories Co., Ltd.
Mouthpieces.—General Electric Co., Ltd.; North British Rubber Co., Ltd.
Insulator rings.—Avon India Rubber Co., Ltd.
Bronze and copper wire.—T. Bolton & Sons, Ltd.; British Insulated and Helsby Cables, Ltd.; Elliott's Metal Co., Ltd.; Enfield Cable Works, Ltd.; Johnson & Nephew, Ltd.; Johnson, Clapham & Morris, Ltd.; Nevill, Druce & Co., Ltd.; Pirelli-General Cable Works, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co. (incorporated with the London Electric Wire Co. and Smiths, Ltd.); J. Wilkes, Son and Mapplebeck, Ltd.
V.i.r. wire.—W. Geipel & Co., Ltd.
Leclanché zinc rod.—Eyre Smelting Co., Ltd.; Locke, Lancaster and W. W. & R. Johnson & Sons, Ltd.
Manufacture, supply, drawing-in and jointing cable.—Newport-Risca: Western Electric Co., Ltd. Burton-on-Trent-Ashby-de-la-Zouch: W. T. Glover & Co., Ltd. Kirkcaldy-Leven: Johnson & Phillips, Ltd.
Manufacture, supply, drawing-in jointing and loading cable.—London Trunk Exchange-Derby Repeater station: Western Electric Co., Ltd.
Electric passenger lift.—Holborn Telephone Exchange: W. Wadsworth and Sons, Ltd.
Telephone exchange equipment.—Wildernesse County Club (Sevenoaks): Lowthian, Drake & Co. Manchester: Relay Automatic Telephone Co., Ltd. Farnworth (Lancs.): British L. M. Ericsson Mfg. Co., Ltd. (Sub-contractors: Chloride Electrical Storage Co., Ltd., for batteries; Crompton & Co., Ltd., for machines.) Bognor: Western Electric Co., Ltd. (Sub-contractors: Tudor Accumulator Co., Ltd., for batteries; Electric Construction Co., Ltd., for charging machine.) Holborn: Automatic Telephone Mfg. Co., Ltd. (Sub-contractors: Chloride Electrical Storage Co., Ltd., for batteries; Newton Bros. (Derby), Ltd., for machines). Worthing: Automatic Telephone Mfg. Co., Ltd. Buxton: General Electric Co., Ltd.
Wireless station steel framework and copper screening for exciter enclosure.—Cary, Hallewell & Co., Ltd.

H.M. OFFICE OF WORKS.

Manholes, cables, &c., National Physical Laboratory, Teddington.—Siemens Bros. & Co., Ltd.

CROWN AGENTS FOR THE COLONIES.

Secondary batteries.—Tudor Accumulator Co., Ltd.
Nickel iron cells.—Pritchett & Gold and E. P. S. Co., Ltd.
Generating plant.—W. H. Allen, Sons & Co., Ltd.; National Gas Engine Co., Ltd.
Electricity meters.—Ferranti, Ltd.
Railway signalling materials.—General Electric Co., Ltd.
Telephone cable, &c.—Siemens Bros. & Co., Ltd.
H.d. copper wire.—F. Smith & Co., Ltd.
Copper wire, &c.—Shropshire Iron Co., Ltd.; J. Wilkes, Sons & Mapplebeck, Ltd.

Guatemala. — The *Electrical World* states that the Allgemeine Elektricitats-Gesellschaft, of Berlin, has closed a contract with the Republic of Guatemala for the construction of an electric power plant at Santa Maria, in addition to an electric railway line from that city to Fuezaltenango. The Republic will issue $3,000,000 of bonds to finance the work.

Irish Free State.—Contracts placed by the Controller of Stores, Department of Posts and Telegraphs:—

OCTOBER.

Dry cells.—General Electric Co., Ltd.; Fuller's United Electric Works, Ltd.
Conduit.—J. McDougall, Ltd.
Electric lamps.—Sphinx Electric Supplies (Ireland), Ltd.
Electric light fittings.—British Thomson-Houston Co., Ltd.
Telegraph testing apparatus.—British Insulated & Helsby Cables, Ltd.
Telephones.—Western Electric Co., Ltd.
Telephone cords.—Phœnix Telephone & Electric Works, Ltd.; British Insulated & Helsby Cables, Ltd.
Telegraph instrument parts.—Weston Electrical Instrument Co., Ltd.
Bronze wire.—F. Smith & Co., Ltd.; W. F. Dennis & Co., Ltd.

NOVEMBER.

Switchboard cable.—General Electric Co., Ltd
Secondary cells.—Chloride Electrical Storage Co., Ltd.
Telegraph instrument parts.—General Electric Co., Ltd.; J. Hill & Sons.
Telephone parts.—General Electric Co., Ltd.; Sterling Telephone and Electric Co., Ltd.; Eyre Smelting Co., Ltd.
Testing apparatus.—Cambridge Instrument Co., Ltd.—*Irish Electrician.*

Kilmarnock.—Town Council. Accepted:—
Electric lighting installation at houses in Scott Road (£201).—James Laird & Co.

Liverpool.—Cheshire Lines Committee.
Transient track circuits between Baguley and Northenden.—Automatic Telephone Mfg. Co., Ltd.—*Modern Transport.*

London.—MARYLEBONE.—London & North-Eastern Railway, G.N. Section. Accepted:—
"Cosmos" vacuum and gasfilled lamps for the 12 months ending December 31st, 1925. (portion of the company's requirements).—Metro-Vick Supplies, Ltd.

London & North-Eastern Railway, Great Central Section.
"Cosmos" gasfilled lamps and "Cosmos" vacuum train-lighting lamps for 12 months ending December 31st, 1925.—Metro-Vick Supplies, Ltd.

London Electric Railway Co. Accepted:—
Supply of "Cosmos" vacuum traction-type series burning lamps.—Metro-Vick Supplies, Ltd.

POPLAR.—Electricity Committee.—It is recommended that orders be placed with Vickers & International Combustion Engineering, Ltd., in accordance with its contract, for the following plant:—
Screw conveyor (£414).—Mitchell Conveyor Co., Ltd.
Feeders (£2,175); interconnecting pipework (£150); burners (£761); pulverised coal bunkers (£828).—Vickers and Int. Com. Eng., Ltd.
Boiler feed pumps (£1,443).—G. & J. Weir, Ltd.
Drier fans (£90); primary air fans (£240); forced-draught fans (£496); induced-draught fans (£462).—Musgrave & Co., Ltd.
Circulating pumps (£955).—Mirrlees, Watson & Co., Ltd.

In connection with the power station extensions, the condensing plant for the 10,000-kW turbo-alternator is to be of the Contraflo high-vacuum design supplied by Vickers, Ltd.

Luton.—Town Council. Accepted:—
Installing electric light at the covered market (£187).—S. Richardson.

Spain. — Brown, Boveri & Co., of Baden, Switzerland, have secured a contract for a 600-h.p. steam turbo-alternator for the electricity station of the Compañia de Aguas de Burgos.

Stoke-on-Trent.—Town Council. Accepted:—
Weigh tanks, weigh bridges, &c., for central power house (£1,107).—Aiton & Co., Ltd.
Structural steel work over new boilers (£551).—Ashton, Frost & Co., Ltd.

Tynemouth.—Corporation. Accepted:—
Cables (£1,410).—Macintosh Cable Co., Ltd.

Weymouth.—Electricity Committee. Accepted:—
Distribution pillars (£148).—W. T. Henley's Telegraph Works Co., Ltd.
Laying cables (£177).—Johnson & Phillips, Ltd.
Renovation of the 200-kW gas engine (£725).—Browett, Lindley & Co., Ltd

Forthcoming Events.

Electrical Power Engineers' Association (Southern Division).—Friday, January 2nd. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 7 p.m. Lecture on "Transformer Design," by Mr. F. W. Berry.

Junior Institution of Engineers.—Friday, January 2nd. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette on "Modern Flour milling Machinery," by Mr. W. Ringrose.

Notes.

Electricity Strike Threat.—Last week the Electrical Trades Union gave notice that its members employed by the Brompton and Kensington Electricity Supply Co., London, would cease work on Tuesday, December 23rd, unless the company dismissed two members who were in arrears with their subscriptions. The company declined to take any action in a dispute between the Union and its members, and announced that the supply would be maintained without interruption, and that it would not be able to reinstate employés who ceased work. It was rumoured that at a meeting of shop stewards to be held on Monday evening, the extension of the proposed strike to other London power stations would be considered.

However, late that evening the two members in question paid the re-entry fee fixed by the Union (£3), and the cause of the dispute being thus removed, the strike notices were withdrawn.

The matter is referred to in a leaderette in this issue, which, owing to the holidays, had to be sent to press before the settlement was reached.

Laying Bricks Electrically.—An electric bricklaying machine which it is claimed lays 1,200 bricks an hour is the latest application of electrical energy to industry. Upon rails placed around the outside walls of a building a travelling boom is set, and upon this are the mortar tank and the laying mechanism, driven by a 3-h.p. electric motor. The laying wheel rotates, taking two bricks from the carrier, while another wheel spreads mortar as the carrier moves along the boom. At the end of the wall the machine changes direction and proceeds as before until it has laid one row of bricks entirely around the building. The boom is then raised the thickness of one row of mortar and bricks, and another trip begins.—*Electrical World.*

Educational.—SIR JOHN CASS TECHNICAL INSTITUTE.—The Institute authorities have sent us a syllabus of classes for the 1924-25 session. Accompanying this are handbills setting forth details of a series of lectures on "Electro-Metallurgy" by Mr. H. M. Chapple, A.R.S.M., and a course on "Alternating Currents and Electrical Oscillations" by Mr. D. Owen, B.A., D.Sc.

Local Societies.—UNIVERSITY COLLEGE, LONDON, ENGINEERING SOCIETY.—The annual dinner of the Society will be held at the College on January 26th. Sir Alexander Kennedy, who was Professor of Mechanical Engineering from 1874 to 1889, will preside, and Prof. T. Hudson Beare, who succeeded Sir Alexander Kennedy, will also be present. The new engineering laboratories and drawing office will be open after dinner. There will be exhibits and demonstrations in all departments. Application for tickets (price 7s. 6d.) should be made forthwith to Mr. R. B. Winton, Engineering Society, University College, London.

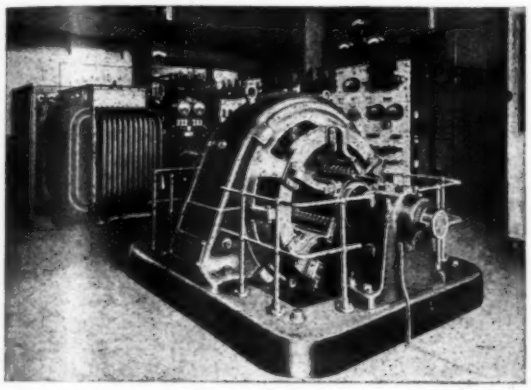
EDINBURGH ELECTRICAL SOCIETY.—At a meeting of the Society on December 12th a lecture on "Isolated Plant, &c.," fully illustrated with over 60 lantern slides, was given by the vice-president, Mr. J. G. Burchell, M.I.E.E. The Society's social evening and dance will be held on January 9th at the Albyn Rooms.

ELECTRIC VEHICLES.—Mr. D. E. Batty recently lectured to the members of the Scottish Branch of the Institution of Automobile Engineers at Glasgow on "The Electric Road Vehicle: Its Characteristics and Its Economic Field of Usefulness." A discussion followed, and Mr. C. W. Marshall, of Glasgow Corporation Electricity Department, stated that the experience of his department, extending over 2¼ million vehicle miles, had shown that battery vehicles were exceptionally reliable. They certainly could not compete with other vehicles on long-distance work, but on work usually covered by horses the battery vehicle was undoubtedly more economical.

Appointments Vacant.—Plumber-jointer for the Ealing Corporation Electricity Supply Department. Electric welder for the Derby Corporation Tramway Department. Technical mains assistant for the Swansea Corporation Electricity Department. Mains assistant, for the Carlisle Corporation Electricity Department. (See our advertisement pages to-day.)

Extensions at Stoke Newington. — The Metropolitan Borough of Stoke Newington derives its supply of electricity in bulk from the North Metropolitan Electric Power Co. at 11,000 volts a.c., and converts it to 460 volts d.c. Originally the plant comprised two 120-kW motor converters; to these were added at various times a 75-kW steam set, a 400-kW motor converter, and a 500-kW rotary converter, the last being in 1920. Since then the output has doubled; further extensions were necessary, and Mr. C. S. Hann, the borough electrical engineer, drew up a scheme, recommending that there should be added a second 500-kW rotary converter, high- and low-pressure switchgear, and new feeders. Mr. C. H. Wordingham, who was consulted, endorsed Mr. Hann's recommendations, and the work was put in hand; the General Electric Co., Ltd., received the orders for the 500-kW rotary and the switchgear.

The 11,000-volt switchboard is of the truck cubicle type, comprising 11 cubicles. With the exception of the section breaker all the oil circuit breakers are of the G.E.C. Type IV, of 100,000 kVA maximum breaking capacity, with three overload trips, operated through time-limit relays; the sectionalising breaker is of the same type, but is non-automatic. Above the board, enclosed in a steel plate cubicle, is accommodated



New Plant at Stoke Newington.

a set of surge arresters of the horn gap type with isolating switches. To control the output of the 500-kW rotary converter there is a switchboard of the flat back type with nine white marble panels, equipped for six outgoing circuits of 700-A capacity, and also a station lighting feeder and metering panel. The main incoming and outgoing lines are controlled by a double-pole G.E.C. "Salford" circuit breaker. Two sets of bus-bars are included, and change-over switches enable each circuit to be connected to either set of bus-bars.

In view of the rapid development of the undertaking there is no reason to doubt that further extension is but a question of time; two 1,000-kW converters can be installed in the present station when necessary, and the two 120-kW converters can be supplanted by a 750-kW set.

A view of the new plant is given herewith.

Reunion of the Ferrantians.—On December 17th the third reunion of Old Ferrantians was held at the Hotel Cecil, nearly 50 being present; the chair was occupied by Mr. H. W. Kolle and Dr. S. Z. de Ferranti was the guest of the evening. Many messages were received from Ferrantians unable to attend the function. In proposing the toast of the evening, the chairman expressed his pleasure at the award of the Faraday Medal to Dr. Ferranti—the greatest compliment that the industry could bestow. He reviewed the career of their guest and showed how he had anticipated the fundamental principles of modern electricity supply. The toast was received with musical honours, and in his reply Dr. Ferranti gave interesting reminiscences of early days, and pointed out how much remained to be done. Other speakers were Mr. C. L. Addenbrooke, and A. E. Hadley.

A special souvenir menu, autographed by Dr. Ferranti and containing sketches of early Ferranti apparatus, was presented to each guest. Ferrantians who could not attend are invited to apply to the hon. secretary, Mr. W. E. Warrilow, 40, Mildred Avenue, Watford, for copies of this menu.

Hydro-Electric Works in Austria.—According to official statements the quantity of water power available in Austria, at minimum flow of water courses suitable for exploitation, is estimated to be about 1.7 million h.p. Of this only about 16 per cent. is in use, and a further 4 per cent. is being developed. Nominally the harnessed water power is equivalent to 230,000 turbine h.p., and stations under construction represent 65,000 turbine h.p., leaving about 1.4 million h.p. to be developed. The most prominent of the hydro-electric works completed this year is that at Partenstein, Upper Austria, the opening of which took place on October 24th. After the completion of the third portion this plant will have a maximum power of 38,000 h.p., and a yearly production of 60-100 million kWh. From this station 40 million kWh is to be transmitted to the vicinity of Vienna, a distance of 210 kilometres (about 140 miles), at a pressure of 110,000 V. Other stations completed were the plant of the Niederösterreichische Electricitäts Wirtschaft Aktien Gesellschaft (Lower Austrian Electricity Economy Company) at Erlaufboden, with a capacity of 4,800 h.p., that at Oberndorf (the same company) with 1,500 h.p., and the Kehrbach Works in Brunnenfelf, with a maximum output of 1,500 h.p. Among the largest plants now under construction are the Spuller Lake power plant of the Austrian Bundesbahnen (Railway Company), with a capacity of 24,000 h.p., the Abbs power plants of the City of Vienna, in Opponitz, with a capacity of 15,000 h.p., the Strublkamm Works of the city of Salzburg, 10,650 h.p., the Bären Works in the Fuscher Valley, owned by the Electricity Co. at Salzburg (10,700 h.p.), the Teigitsch Works, owned by the Steyr Water Power & Electricity Co., 24,000 h.p., and the Forst Lake power plant of the Kärnthner Water Power Co., with a maximum output of 5,000 h.p. The initial works of the huge Achen Lake power plant have recently been commenced. The owner of this undertaking is the Tyrolean Hydro-Electric Co., and it will be one of the biggest works of Austria, its maximum output being 100,000 h.p.

Institution Notes.

Institution of Electrical Engineers.—INFORMAL MEETING.—At the informal meeting, on December 15th, Mr. F. Pooley in the chair, Mr. F. C. Raphael opened a discussion on "The New Wiring Regulations of the I.E.E." After reviewing the origin and intention of the Wiring Regulations, Mr. Raphael criticised many of their stipulations. His chief concern seemed to be for the status of existing installations now in good life and service, which do not conform to the new Regulations, but obviously cannot be condemned. The discussion made it clear that the Regulations do not prescribe existing work, nor can they be enforced for future installations, but must be regarded as a standard specification for a first-class job according to the lights of 1924. Mr. Ll. B. Atkinson said all rules must contain a large element of compromise, and no member of the Committee would dispute that some of the rules could be amended—but he had no use for the school of thought which wished to be without rules, and felt that any installation should pass if it did its job. On the question of the earthing stipulations that had caused so much uneasiness, was it fair to put up an installation in such a way that negligent or ignorant people could get a shock? With regard to using a lampholder as a place to attach portable apparatus, the idea was due to U.S.A. practice, where they had a large contact screwholder attachment. Those who scoffed at the idea of danger should know that the Committee had plenty of instances of trouble, and the objections to the proposed remedies were not worth the life of a single individual. It was the business of the Institution to tell people what was required to make a 1924 installation, and the adoption of the Regulations would make an end of the operations of those who were putting up installations without any knowledge, conscience, or care.

Mr. W. R. Rawlings said the new Regulations would not put up the cost by providing anything more than a standard installation should contain.

Messrs. J. J. Bacon, H. J. Cash, P. Davies, J. M. Donaldson, E. B. Hunter, H. Marryat, F. W. Purse, W. E. Rogers, K. A. Scott-Moncrieff, L. G. Tate, W. E. Warrilow, and H. T. Young also spoke.

Mr. Raphael, in conclusion, appealed for another rule that should make it clear that installations existing before the date of publication of the Regulations should not be declared unsafe.

As time did not allow of all members speaking who wished to do so, the chairman stated that another evening might be allocated to the subject later in the session.

WESTERN CENTRE ANNUAL DINNER.—At the meeting of the Western Centre, at the Grand Hotel, Bristol, on January 12th, 1925, at 4.30 p.m., the president of the Institution (Mr. W. B. Woodhouse) will address the members, and the annual dinner will follow at 6.15 p.m.

SCOTTISH CENTRE ANNUAL DINNER.—There was a distinguished gathering at the annual dinner of the Scottish Centre of the Institution in Glasgow, on December 16th, including Lieut.-General Sir Walter P. Braithwaite, K.C.B., General Officer Commanding-in-Chief, Scottish Command; Commander E. G. de S. Jukes-Hughes, R.N., Senior Naval Officer, Glasgow District; Mr. W. B. Woodhouse, president of the Institution; Mr. S. G. Forsythe, Postmaster of Glasgow; Dr. Stockdale, Director of the Royal Technical College; Prof. Mellanby; Mr. A. Page, vice-president of the Institution; Mr. R. B. Mitchell, past-chairman of the Centre; Mr. J. R. Sutherland, &c. Mr. Alex. Lindsay, chairman of the Centre, was in the chair. Replying to the toast of the "Lord Provost and Magistrates," Bailie Dewar referred to the smoke problem, due principally to domestic chimneys, and said that a way

in which they could eliminate that nuisance was by the use of electricity. Prof. Mellanby, who proposed the toast of the evening, "The Institution of Electrical Engineers," spoke of the development of the industry. Why, he asked, was it that an industry of such youthfulness could turn out products of such remarkable efficiency? The answer was, he believed, that practically from the beginning the development of electrical machinery had been controlled by scientific investigation of the highest type. Having mentioned that only 7 per cent. of the houses in Glasgow were electrically lighted, he raised a laugh by remarking that it would be a good thing if the chairman of the local branch of the Institution were compelled to be a member of the Town Council. Mr. Woodhouse, who replied, said that electrical engineers were making the world smaller by developing the means of communication and transport. The work of the electrical engineer was very largely a study of the means to economy, and it brought him into very close connection with the prosperity of the country. To-day the world seemed to think that prosperity, if it was to come quickly, was to come through the agency of electrical engineers, and he hoped and believed that was true. Mr. R. B. Mitchell, in a happy speech, proposed "Our Guests."

TEES-SIDE SUB-CENTRE.—Mr. W. R. Cooper, lecturing to the Tees-side Sub-Centre of the North-Eastern Centre of the Institution at Middlesbrough, on December 18th, said the object of his paper was to indicate or suggest certain processes which might be used with advantage in order to prevent the waste of combustible gases going on at some time or other in most blast-furnace and coke oven plant. In the first place, it was advisable to convert the waste gases into electricity either by the use of gas engines after cleaning the gas or by burning the gas under boilers and generating electricity by steam engines. The latter method had one great advantage over the former. In a blast-furnace plant it was absolutely essential that the electric power supply must on no account be interrupted, and it sometimes happened that the supply of gas was reduced owing to various causes. One of the most useful applications was the electric furnace in its various forms. It was agreed among steel manufacturers that the electric-arc furnace was ideal for making special high-grade alloy steels. The advantage of the electric over the gas-heated furnace lay principally in the fact that the heat was produced inside and prevented from escaping as far as possible, whereas in the other methods the heat must be transmitted through the walls of the crucible or retort, much of it passing into the chimney instead. During the war the Germans were able to obtain all the nitrates they needed for explosives by means of the electric furnace. In a long account of various ways for utilising surplus electricity, he urged that, in addition to works plant, such electricity might be made greater use of in the laboratory.

Junior Institution of Engineers.—On December 12th, Mr. H. G. Bouly, B.Sc., read a paper on "Fluid Transmission Gears." The speaker said that all fluid transmission gears that had proved successful up to the present time used oil as the transmitting agent. Experiments had, however, been carried out with a view to developing steam and compressed air gears, and some results might be published shortly which would be very interesting.

Institute of Transport.—YORKSHIRE LOCAL SECTION.—A meeting of the Section will be held in the Town Hall, Leeds, on January 12th, when Mr. J. B. Hamilton, C.B.E., the chairman of the Section, will deliver his inaugural address.

Germany and Irish Water Power.—The Dublin correspondent of the *Morning Post* reports that the Dail has approved the report prepared by Messrs. Siemens, Schuckert, of Berlin, for the production of electric power from the Shannon. The report stated that the River Liffey should also be developed later on, but not at present, because it was too small, and the experts believed that current would be delivered from the Shannon to Dublin cheaper than from the Liffey. The constructional costs of the partial development were estimated at £5,250,000. It was calculated that the cost of current would not be more than .53 of a penny per kWh.

Our Personal Column.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

A Manchester paper states that on the occasion of the retirement from the Manchester Corporation Electricity Department of Mr. J. A. CONSTANTINE, chief mechanical engineer, after twenty-five years' service, the workmen of the Dickinson Street and Bloom Street stations presented him with a watch, an umbrella, and a pipe.

Mr. F. G. PENNY, technical engineer to the Rotherham Corporation Electricity Department, is leaving to take up a position on the executive of the Shanghai Electricity Supply Undertaking.

The *Australian Electrical Times* states that Mr. J. H. BUTTERS, C.M.G., general manager and chief engineer, Tasmanian Hydro-Electric Department, has been appointed chairman of the Canberra Commission, which will control the building of the Federal Capital, at a salary of £3,000 a year. Mr. Butters was born in England in 1882. He went to Australia about 12 years ago as manager of the Hydro-Electric Power & Metallurgical Co.

The same contemporary reports that Mr. R. VINE HALL has been acting as deputy general manager of the Sydney City Council's Electricity Department during the absence of Mr. S. Y. Maling on a visit to Great Britain and America. Also that Mr. E. P. GROVE, of Messrs. Merz and McLellan, left Australia for New Zealand in October to report for his firm on the proposed electrification of the New Zealand Government Railways.

Mr. P. J. PYBUS, managing director of the English Electric Co., Ltd., and Liberal candidate for the Shipley (Yorkshire) Division at the last two General Elections, was, on December 16th, at a social gathering of the Liberal Party at the Victoria Hall, presented with a gold hunter dress watch, bearing an inscription indicating that it was given by the Liberals of Shipley in recognition of his fights in uplifting Liberalism in the area in the 1923 and 1924 elections.

Herr FRITZ FUNK has just been elected president of Brown, Boveri & Co., of Baden, with Herr GEORG BONIN as vice-president.

Alderman SAMUEL FLINT, J.P., who for many years was chairman of Leicester Electricity & Tramways Committee, and later was chairman of the Electricity Committee (after the two departments were separated) recently resigned the latter position. On December 16th he was presented by the staff with a testimonial consisting of a solid silver inkstand. Mr. T. R. Smith, electrical engineer, made the presentation, and Councillor Swain (chairman of the Electricity Committee) and Alderman Banton (chairman of the Tramways Committee) paid tributes. Alderman Flint, in reply, said the first duty of a chairman was to see that the undertaking in his charge was conscientiously organised with a view to its efficiency, and the second to see that the officials and working staff were fairly dealt with in the matter of remuneration and conditions.

Mr. G. TOUGH, engineer and manager of the Coventry Corporation Electricity Department, has been presented by the staff and employés with a solid silver tea and coffee service, to commemorate his completion of 25 years' connection with the department. The presentation was made on December 16th by Alderman M. K. Pridmore, who said that when Mr. Tough was appointed manager the output was five million units per year, but they now did that in a month. Alderman F. Lee attributed Mr. Tough's success to his "saving little and doing much." He enjoyed the hearty co-operation of his staff, and did not hesitate to praise them. Mr. W. Marston, deputy manager, spoke on behalf of the staff and employés, and the Town Clerk followed, remarking that though Mr. Tough said very little, what he did say was very much to the point, and he stuck to it. Mr. Tough responded, expressing his delight at the appreciation shown of his services. He said that the success of the undertaking had been largely due to the assistance he had received; no chief of a department could run it successfully unless he had the whole-hearted support of the staff and employés.

On December 12th, at the Horseshoe Hotel, Tottenham Court Road, the members of the staff of the Sterling Telephone & Electric Co., Ltd., gave a dinner and presentation to Mr. F. STACEY HOOKER, who recently resigned from the sales managership of that company to take over the general managership of Messrs. C. A. Vandervell & Co. Mr. F. G. Bell occupied the chair, and the company present numbered over 40. Mr. Bell wished Mr. Hooker every success in his new appointment, and asked his acceptance of a clock which had been subscribed to by the staffs of both the head office of the company and the works at Dagenham. Mr. Hooker, in accepting, gave an interesting history of his association with the Sterling Co. since 1901, and expressed his pleasure at seeing present so many who had been associated with him through the years which had marked the amazing growth of the company.

At the last meeting of the London County Council the General Purposes Committee reported that it was not yet in a position to submit a recommendation for a new arrangement consequent on the retirement of Mr. A. L. C. FELL, the tramway manager, who is retiring at the end of the year. On the recommendation of the Committee, it was decided to appoint Mr. J. K. BRUCE, traffic manager, to take over the duties of general management until April 30th, with an allowance of £150.

The Times states that after being associated with the Metropolitan-Vickers Electrical Co. and its predecessors for 35¼ years, Mr. A. E. SCANES, secretary of the company, will retire at the end of the current year. Mr. R. H. HAVILAND has been appointed acting joint secretary as from January 1st.

Stoke Newington Borough Council General Purposes Committee recommends that the salary of Mr. H. LARGE, deputy borough electrical engineer, be increased to £425 per annum as from December 1st, 1924, and to £450 as from December 1st, 1925, and that the salary of Mr. E. G. MACKENZIE, technical assistant, be increased to £350 per annum without bonus as from December 1st, 1924.

At the Great Northern Hotel, Leeds, on December 20th, the senior staff of the Yorkshire Electric Power Co. entertained Mr. W. B. WOODHOUSE, the engineer and manager of the company, at a complimentary dinner in honour of his recent election as President of the Institution of Electrical Engineers. Mr. J. H. Stansfield, the secretary of the company, was in the chair. In proposing the health of the guest of the evening, Mr. Stansfield referred to the long and varied experience which Mr. Woodhouse had of the electrical industry in all its branches and the great interest he had taken for many years in the Institution both in Yorkshire and in London.

SIR FRANCIS VOULES has been elected chairman of the International Light and Power Co. and the Para Electric Railways and Lighting Co., Mr. Follett Holt having retired.

An American exchange reports Sir ADAM BECK (chairman of the Ontario Hydro-Electric Power Commission) as saying in a recent speech that he is giving serious consideration to retiring from public life.

It is announced that Mr. D. B. MORISON, chairman and managing director of Richardsons, Westgarth & Co., Ltd., of Hartlepool, &c., who has been in indifferent health for some time, is terminating his association with the company at the end of this year. He is to be followed in the chair by Mr. TOM WESTGARTH, who has been, like Mr. Morison, a director of the company from its formation. Mr. G. Clark becomes managing director and Mr. L. D. Wingate general manager.

Luton Town Council has received the resignation of Mr. W. W. CLARKE, engineer and manager of the tramways, who has obtained another appointment.

As from January 1st, Mr. W. W. COOK, M.Inst.C.E., M.I.E.E., of Winchester House, E.C.2, has taken into partnership Mr. S. H. POOK, A.C.G.I., M.I.E.E., who has been associated with him from the establishment of the firm, and was previously in the engineering department of the National Telephone Co. The title of the firm will be W. W. Cook and Partners.

Obituary.—MR. F. W. MATTES.—We regret to learn from the *Australasian Electrical Times* that Mr. Frank William Mattes, a director of the British General Electric Co., Ltd., was accidentally drowned at Avoca, N.S.W., on October 13th. Mr. Mattes, who was 40 years of age, went to Australia from England in 1910 to superintend the erection of a large telephone switchboard in Victoria for the Commonwealth Government on behalf of the Peel Conner Telephone Works, and on the latter company becoming absorbed by the General Electric Co., Ltd., of England, Mr. Mattes became associated with the British General Electric Co., Ltd., the agents of that company in Australia. He held executive positions in various trade organisations, and was vice-president of the Electrical Federation (Victoria).

MR. J. BALCH.—Mr. John Balch, a shift engineer at the power station of the Charing Cross, West End and City Electricity Supply Co., at Bow, was run over by a motor-'bus and killed through his cycle skidding while he was on his way home in High Street, Stratford. A verdict of "Accidental death" was returned.

MR. J. L. HARPER.—The death occurred at Niagara Falls, on November 28th, of Mr. John L. Harper, vice-president and chief engineer of the Niagara Falls Power Co. The *Electrical World* states that his decease removes an outstanding hydro-electric engineer, who had been for 22 years associated with power development at the Falls. He was 51 years of age and had just undergone an operation for appendicitis. Mr. Harper became senior partner in the engineering firm of Harper and Taylor, Inc., in March last, with offices in Philadelphia and Niagara Falls. He was chief engineer of the Canadian Niagara Power Co., was a member of various electrical and other engineering societies, and was much in demand as a lecturer on Niagara Falls power development.

MR. D. SHANKS.—The death took place on Saturday morning, following an operation for appendicitis, of Mr. David Shanks, J.P., head of Messrs. Shanks, brass manufacturers and makers of gas and electric light fittings.

Will.—The late SIR MAURICE FITZMAURICE, F.R.S., &c., left £94,215. He gave £100 to the Benevolent Fund of the Institution of Civil Engineers and a like amount to the Pension Fund of the Royal Society.

New Companies Registered.

Sylvex, Ltd. (202,435).—Private company. Registered December 15th. Capital, £300 in £1 shares. To carry on the business of manufacturers of and dealers in chemical compounds, metals and mineral ores and other substances used as crystal detectors for wireless receiving sets, and in particular the crystal known as "Silverex," &c. The first directors are:—E. Cook, 20, Unwin Mansions, Queen's Club Gardens, S.W., director of companies; S. Salisbury, 6, The Terrace, Champion Hill, S.E.5, theatrical advertising contractor. Qualification, one share.

Radio International Publicity Services, Ltd. (202,417).—Private company. Registered December 13th. Capital, £100 in £1 shares. To carry on the business of publishers of newspapers, journals, books and other literary works of Radio International Publicity Services carried on by L. F. Plugge at 23, Devonshire Street, W.1. The subscribers (each with one share) are:—L. F. Plugge, 5, Pall Mall Place, St. James's, S.W., civil and mechanical engineer; A. E. Leonard, 25, Portland Place, W.1, solicitor. A. E. Leonard signs documents as director. Qualification, 10 shares. Remuneration, £10 each per annum (chairman, £25). Secretary: A. Williams. Solicitor, M. C. Pyke, 6, Portland Place, W.1. Registered office: 23, Devonshire Street, W.1.

Grierson Ledway Co., Ltd. (202,427).—Private company. Registered December 15th. Capital, £3,000 in £1 shares. To carry on the business of engineers' furnishers, electrical engineers, contractors, dealers in mechanical and electrical apparatus and appliances, &c. The subscribers (each with one share) are:—R. Hannah, 115, Abbey Road, Barrow-in-Furness, gentleman; J. W. Grierson, 21, Crellin Street, Barrow-in-Furness, picture frame manufacturer. The subscribers are to appoint the first directors. Qualification, 1 share. Remuneration, £5 each per annum. Secretary: W. Grierson. Registered office: 149, Ainslie Street, Barrow-in-Furness.

Radio and Electrical Supplies (Bolton), Ltd. (202,440).—Private company. Registered December 15th. Capital, £300 in £1 shares. To carry on the business of factors, manufacturers, importers and exporters of radio, electrical and mechanical goods, &c. The first directors are:—A. S. Horrocks, "Trentham," Ladybridge Lane, Heaton, Bolton; N. A. Taylor, 61, Foundry Street, Bolton; A. A. Holt, address not stated. Qualification, 50 ordinary shares.

Baynton's Wholesale Wireless, Ltd. (202,482).—Private company. Registered December 17th. Capital, £2,500 in £1 shares. To acquire the wholesale wireless business carried on by C. S. Baynton, of New Street, Birmingham. The subscribers (each with one share) are:—C. S. Baynton, 48, Russell Street, Moseley, Birmingham, photographic dealer; E. E. Brooks, 55, Ravenhurst Road, Harborne, Birmingham, clerk. E. E. Brooks is the first director. Qualification, £1. Solicitors: Wallace Robinson and Morgan, 63, Temple Row, Birmingham. Registered office: Winchester House, Victoria Square, Birmingham.

Official Returns of Electrical Companies.

Radio Stocks, Ltd.—E. H. Hawkins, of 4, Charterhouse Square, E.C.1, and H. Foord, of City Road, E.C., ceased to act as receivers or managers on December 4th, 1924.

British Electric Traction Co., Ltd. (49,855).—Return dated June 30th, 1924. Capital, £2,998,397 15s. £712,744 5s. 6 per cent. cumulative participating preference stock and £1,326,263 10s. ordinary stock taken up. £2,039,007 15s. paid. Mortgages and charges, £1,639,897.

Penarth Electric Lighting Co., Ltd. (52,912).—Return dated June 10th, 1924. Capital, £50,000 in 2,500 ordinary and 2,500 preference shares of £10 each. 500 preference and 2,500 ordinary shares taken up. £10 per share called up on the ordinary and £1 on the preference. £25,500 paid. Mortgages and charges, £15,937.

Direct West India Cable Co., Ltd. (53,956).—Return dated October 9th, 1924. Capital, £120,000 in £5 shares. 12,000 shares taken up. £60,000 paid. Mortgages and charges, nil.

Pope's Electric Lamp Co., Ltd. (101,293).—Return dated July 3rd, 1924. Capital, £25,100 in 25,000 preference and 100 ordinary shares of £1 each. 23,579 preference and 100 ordinary shares taken up. £5,254 paid. £18,425 considered as paid. Mortgages and charges, nil.

Llangollen and District Electric Light & Power Co., Ltd. (75,384).—Return dated July 24th, 1924. Capital, £6,000 in 3,500 ordinary and 2,500 preference shares of £1 each. 1,754 ordinary and 360 preference shares taken up. £1 per share called up. £2,110 15s. paid, leaving £3 5s. in arrears. Mortgages and charges, £3,500.

Satisfaction in full (a) on November 27th, 1923, of debenture and mortgage dated October 4th, 1911, securing £500; and (b) on December 3rd, 1924, of debenture and mortgage dated May 13th, 1920, securing £1,000. (Notices filed December 12th, 1924.)

Imperial Tramways Co., Ltd. (58,981). — Return dated April 12th, 1924. Capital, £400,000 in 20,000 preference and 20,000 ordinary shares of £10 each. All shares taken up. £100,000 paid. £300,000 considered as paid. Mortgages and charges, £300,000.

Ferranti, Ltd. (83,718).—Return dated September 25th, 1924. Capital, £300,000 in 100,000 6 per cent. preference, 100,000 7 per cent. second preference, and 100,000 ordinary shares of £1 each. 71,166 6 per cent. preference, 75,000 7 per cent. second preference, and 60,000 ordinary shares taken up. £206,166 paid. Mortgages and charges, £51,934.

W. R. Sykes Interlocking Signal Co., Ltd. (93,078).—Return dated October 29th, 1924. Capital, £50,000 in 87,500 "A" and 12,500 "B" shares of 10s. each. 42,297 "A" and 12,500 "B" shares taken up. 3s. 9d. per share called up on 42,297 "A" shares. £7,936 18s. 9d. paid (including £6 5s. paid in advance of calls). £16,824 5s. considered as paid, being 10s. per share on 12,500 "B" shares, and 5s. per share on 42,297 "A" shares. Mortgages and charges, £17,526.

Wilfred Rogers & Co., Ltd.—A. E. Tilley, of 8, Staple Inn, Holborn, W.C., ceased to act as receiver or manager on December 11th, 1924.

Wireless Valves, Ltd. (Old Co.).—G. A. F. Marreco, of The Pathway House, Woking, ceased to act as receiver or manager on December 3rd, 1924.

Taranto Tramways and Electric Supply Co., Ltd.—Particulars filed of £10,000 debentures, with a premium of 10 per cent. authorised October 9th, 1924, constituting a specific charge on the company's concession and rights in respect of certain tramways in Taranto, Italy, and a floating charge on the company's undertaking and property, the whole amount being now issued. The debentures rank in priority to (a) two charges dated January 7th, 1920, and December 20th, 1921, securing £72,000 and £20,000 respectively; and (b) an issue proposed to be made of £125,000 first mortgage debentures, which has been postponed.

Simms Motor Units (1920), Ltd. — Issue on November 28th, 1924, of £1,600 debentures, part of a series already registered.

Elba, Ltd.—Debenture dated December 5th, 1924, to secure £1,350, charged on the company's property, present and future, including uncalled capital. Holder: E. W. Wood, Carpentarea, Sandy Lane, Wallington.

Frinton-on-Sea and District Electric Light and Power Co., Ltd. (70,689).—Return dated November 4th, 1924. Capital, £10,000 in 7,300 preference and 2,700 ordinary shares of £1 each. All shares taken up. £10,000 paid. Mortgages and charges, £4,000.

Synchronome Co., Ltd. (120,465).—Return dated October 30th, 1923 (filed August 6th, 1924). Capital, £2,000 in £1 shares (1,400 ordinary and 600 preference). All shares taken up. £700 paid. £1,300 considered as paid. Mortgages and charges, nil.

East Anglian Electricity, Ltd. (58,665).—Return dated September 4th, 1924. Capital, £100,000 in 30,000 7 per cent. cumulative participating preference, 69,500 ordinary, and 500 workmen's shares of £1 each. 2,459 preference, 50,108 ordinary, and 500 workmen's shares taken up. £50,395 paid (including £1 on 2 ordinary shares forfeited). £2,673 considered as paid. Mortgages and charges, £21,450.

Exchange Telegraph Co., Ltd. (6,152).—Return dated October 9th, 1924. Capital, £96,430 in 8,023 "A" shares of £10 each and 16,200 "B" shares of £1 each. All shares taken up. £10 per share called up on 6,000 "A" and £2 per share on 2,023 "A" shares. £64,046 paid. £32,384 considered as paid, being £1 per share on 16,200 "B" and £8 per share on 2,023 "A" shares. Mortgages and charges, nil.

Rawlings Bros., Ltd. (67,908).—Return dated September 26th, 1924. Capital, £100,000 in 70,000 ordinary and 30,000 preference shares of £1 each. 50,744 ordinary and 20,685 preference shares taken up. £71,429 paid. Mortgages and charges, nil.

Implitico, Ltd. (138,160).—Return dated November 10th, 1924. Capital, £3,000 in £1 shares. All shares taken up. £3,000 paid. Mortgages and charges, nil.

Pacific and European Telegraph Co., Ltd. (36,683).—Return dated November 27th, 1924. Capital, £100,000 in £10 shares. All shares taken up. £4 per share called up. £40,000 paid. Mortgages and charges, £66,500.

International Wireless Manufacturers, Ltd.—Particulars filed of £4,000 debentures authorised December 2nd, 1924, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £2,700.

W. T. Rawcliffe, Ltd.—F. M. Gilliat, of 36, Spring Gardens, Manchester, ceased to act as receiver or manager on December 10th, 1924.

City Notes.

Edison Swan Electric Co., Ltd.

The 41st annual meeting was held on Wednesday of last week, Mr. C. F. Spencer presiding. In moving the adoption of the report, the Chairman, dealing first with the accounts, said that the capital outlay on plant and machinery during the year had been £9,420. Stocks and stores, which included work in progress, had been valued on a conservative basis and amounted to £290,034. Sundry debtors, after making provision for bad and doubtful debts, totalled £208,434. Sums of £14,418 and £3,015 had been appropriated out of the sinking fund to the redemption of first and second debenture stocks respectively, whilst the sinking fund had been increased to £24,873. The net debt on first and second debenture stocks was £312,786 on June 30th, 1924, and the interest accrued thereon was £5,341. On June 30th, 1923, the debt due to bankers was £314,150, but during the last completed year, £109,000 had been paid off, leaving the balance outstanding at June 30th, 1924, at £205,150. Further repayments had been made since July 1st this year and they hoped to make additional reductions early in the new year. They had again to thank their bankers for the interest they had manifested in their work; this contributed to the agreeable change which had taken place in the fortunes of the business. Sundry creditors and credit balance exhibited an increase of £15,064 on the corresponding figure of last year, due largely to the additional trade which the company was enjoying. The balance of profit for the year, after providing for general expenses, &c., amounted to £122,140. Out of that sum £10,000 had been set aside as reserve for bad and doubtful debts, whilst loan charges had absorbed £37,226, leaving a net profit of £74,914. Under the powers contained in the articles the directors were entitled to fees to the extent of £3,000 and a bonus on profits, but they had only exercised such powers to the extent of £3,410. The board recommended the payment of 7½ per cent. dividend on the preference shares, 10 per cent. on the ordinary shares, being an increase of 2½ per cent. on last year's dividend, and the allocation of £50,000 to the reserve fund. After making these appropriations there remained £17,575 to carry forward to the current year's account, which would more than cover any sums payable in respect of Corporation Profits Tax. The board's policy was to build up reserves and reduce debts; since the company was reconstituted two years ago, £80,000 had been placed to reserve account, whilst debenture and other loan debts had been reduced by £127,433. With reference to the present year's trading, the turnover and profits for the five months to November 30th last showed a substantial increase on the figures for the corresponding period of 1923. Every phase of the company's activities and operations had been carefully examined, resulting in substantial economies in the cost of production at the works; unproductive expenses had been substantially reduced, whilst sales had been augmented by the carrying out of an intensive sales policy, and efficient co-operation had been established in all sections of the business. They now had in operation a method by which production and distribution were conducted in complete accord. They had committees of managers, works superintendents, and branch managers, the members of these committees being remunerated on a basis which had relation to the profits earned, thus creating a mutuality of interests between staff and the company. They must not be unmindful of the possible effects on the business of foreign competition. Many of their foreign competitors' works were situated in countries having a depreciated currency which placed a weapon in foreign producers' hands against which they were commercially powerless. As an illustration, let them assume that the currency of a country was 20 units to the pound sterling in pre-war days, and now was depreciated to 80 units to the pound. They found that wages in such a country had not risen in the same ratio as the currency had depreciated; consequently many foreign producers were able to manufacture at 30 per cent. less labour costs than manufacturers in this country, and when standing charges were added, the disparity between the total cost of the foreign product and the British product was even more marked. Industry should be protected against such unfair competition at least until exchanges became more normal, and for that reason he would welcome the introduction of a Safeguarding of Industries Bill. During the past two years they had been able to make moderate profits, and he saw no reason why they should not do so during the current year, but he saw evidence of foreign competition making inroads into profits at no very distant date, unless some legislation safeguarding some of the industries in which they were engaged was adopted. Mr. A. F. Berry seconded the motion and it was carried.

Agricultural and General Engineers, Ltd.

The annual general meeting of the company was held on December 16th under the chairmanship of Mr. G. E. Rowland. The Chairman, in presenting the report and accounts (*vide* ELEC REV., December 5th, p. 869), referred to the reorganisation scheme which had received the sanction of the Court in November. He said that it had been unfairly stated that the company was a "boom" flotation, which implied inflation and sale at a big profit. This was not true; the company acquired properties well worth £4,400,000 for £1,240 and three millions of shares, since written down to 1½ millions. At the present time they had a floating asset balance of £2,120,000. At the time of the formation of the company the concerns taken over were solvent and had they required temporary assistance they could have obtained it from their bankers on much more favourable terms than were offered to the public. Acting upon the proposals of the Advisory Managing Board the selling policy had been changed and now they were selling more than before at an approximate reduced cost of £90,000 per annum. The capital reduction scheme instituted 18 months ago was due to the fact that some of the assets were not fully or profitably employed and values had to be brought down to "bedrock" levels. The company was now trading at a profit but he could not promise a dividend in July. He believed, however, that the profit was an increasing one. The report and accounts were adopted and Mr. H. Carlisle was elected to the board as representative of the preference shareholders.

British Columbia Electric Railway Co., Ltd.

This company's report was reviewed in our last issue (p. 946). The annual meeting was held in London on December 18th, when Mr. J. Davidson (deputy chairman), in the course of his speech said that the accounts reflected a year of progress and prosperity. The importance of Vancouver was rapidly increasing, and the exportation of wheat from that port had shown remarkable growth. He read a number of official statistics to show that in a period of general trade depression British Columbia continued to progress. The company's business showed a general advance, with but one exception. This was a decline in the freight traffic which was due to the very serious stagnation in the lumber industry; they had reason to hope, however, that this business would increase during the current year. The company's business now involved a capital investment of $12,000,000; it was steadily growing and future requirements had to be carefully studied and estimates constantly revised, requiring a great deal of caution and courage: caution to ensure that they did not provide too far ahead, and courage to see that they did not lag behind but made provision in good time to supply the reasonable requirements of the communities which they served. In conclusion, he expressed the thanks of the company to the staff for their untiring efforts.

Amalgamated Wireless (Australasia), Ltd.

The accounts for the year ended June 30th last show that the gross profit fell from £68,666 to £53,787, while the expenses increased from £61,833 to £68,291. The net result was a deficit of £21,418, as compared with a profit of £438 in the previous year. The report states that a loss of £13,372 was incurred in the manufacture of broadcasting apparatus, and the disappearance of profits was due largely to the readjustment of stock values. The subsidiary company, Australectric, Ltd., also had a bad year, showing a loss of £11,975. Revenue is expected to accrue from the £100,000 of new capital which was issued during the year. At the meeting, which was held in Sydney on October 30th, the chairman (Mr. G. M. Allard) attributed the position to differences among the various interests concerned with broadcasting. Since the commencement of the current year the situation had improved and the subsidiary company had wiped out its loss. Referring to the "Beam" system of communication, the chairman said that the directors believed that this would enable them to establish a commercial system which would combine greater carrying power with less cost. In his references to broadcasting Mr. Allard mentioned that stations had been opened in Sydney, Melbourne and Perth, and that the company had established a radio valve works, and had also produced a new type of receiving set.

Johnson and Phillips, Ltd.

As briefly stated in our last issue, the committee of debenture stock holders, which was formed at the meeting on December 9th, has succeeded in inducing the board to accept a modified scheme in relation to the proposed conversion of the stock. The new proposals, which were to come before the resumed meeting on December 23rd, provided for the continuance of the 8 per cent. interest until July 1st next, when it would fall to 7 per cent.; and that the directors should redeem the stock at the rate of £102 for each £100 of stock should they desire to do this apart from the annual drawings.

Barbados Electric Supply Corporation, Ltd.

The report for the year ended June 30th, 1924, which is to be submitted at the annual meeting on December 30th, shows a trading profit of £9,069, against £8,413 for the previous year, and £5,686 for the year before that. After charging general expenditure in London, debenture and loan interest, and a reserve for taxation, £8,577 stands at the credit of profit and loss (including £2,591 brought forward). Of this, £4,000 has been put to depreciation reserve and £3,000 to renewals reserve, leaving £1,577 to be carried forward. £1,360 has been charged against renewals reserve as the amount expended during the year on special renewals of Diesel plant. The number of consumers increased from 2,665 to 2,864 and the 25 c.p. (equivalent) connections from 29,634 to 36,140. Capital expenditure during the year was £2,847 for additions to power station buildings and to house connections and mains.

Bullers, Ltd.

After meeting all charges, including depreciation, debenture interest, &c., for the year ended July 31st, 1924, there was a profit of £18,924. As considerable capital expenditure on plant has been necessary and as it is desirable to conserve the cash resources for future development, the directors do not recommend a dividend on the ordinary shares. Accordingly, after paying the preference dividend, it is proposed to place £4,997 to the debenture sinking fund, to transfer £5,000 to reserve, and to carry forward £4,289.

Constantinople Telephone Co.

It is announced that, although the business of this company has continued to develop, in spite of the depression in trade in Constantinople, the directors much regret that, mainly owing to the depreciation in Turkish exchange, it has been found necessary to defer the payment of the coupons on the 6 per cent. obligations and 6 per cent. certificates due January 1st next. The holders of obligations and certificates will be invited to attend a meeting as soon as possible, at which the position of the company will be reported and an arrangement proposed for dealing with the situation pending such an improvement in conditions as will permit interest payments to be resumed.

Companies to be Struck Off the Register.—The names of the undermentioned companies will be struck off the register at the expiration of three months unless cause is shown to the contrary :—

Charmlyn Electrical Co., Ltd.
Manchester Electro-Mechanical Repairs, Ltd.
Portmadoc Electrical and Wireless Supplies Co., Ltd.
St. Helens Motor and Electrical Engineering Co., Ltd.
Shropshire Electrical and General Engineering Co., Ltd.
Standard Wireless Supplies Co., Ltd.
Union Wireless Co., Ltd.
Wimbledon Electrical Co., Ltd.
Wireless Corporation, Ltd.
Crystor-Cowl Insulators, Ltd.
Electro Steel Foundries, Ltd.
Globe Electric Co., Ltd.
Little Wonder Battery Co., Ltd.
Marri Loud-Speaking Telephone Co., Ltd.
Railless Electric Traction Co., Ltd.
Telephone Co. of Egypt, Ltd.

Canadian General Electric Co., Ltd.—Relief on the common share dividends from British income tax, at the rate of 2s. 1d. per £ of gross dividend, has been authorised. Applications for this relief are to be made to the local inspector of taxes.

East London Railway.—The Southern Railway Co. has offered to holders of 2½ per cent. debenture stock £62 10s. of Southern Railway 4 per cent. debenture stock in exchange for each £100 of East London stock.

International Light & Power Co., Ltd.—A dividend of 4½ per cent. less tax has been declared on the preference shares on account of arrears for the nine months ended December 31st, 1923.

German Company.—The *Electric Insulated Wire Company* (late C. J. Vogel), of Berlin, reports a net profit of 100,000 gold marks for the year ended with September 30th, 1924.

French Company.—*La Société de la Maison Breguet*, of Paris, has decided to increase its capital from 8 to 12 million francs and is inviting subscriptions to 8,000 new shares of 500 francs which are being offered at 775 francs each.

Stock Exchange Notice.—Application has been made to the Committee to allow the following to be officially quoted :—

Madras Electric Tramways (1904).—£130,000 5½ per cent. (registered) debentures of £100 each, Nos. 1 to 1,300.

New Issue.—*Sir W. G. Armstrong, Whitworth & Co., Ltd.*—The issue of £3,000,000 6½ per cent. consolidated mortgage debentures at £99 10s. was fully taken up by December 16th.

Shawinigan Water and Power Co.—Dividend of $1¾ per share on the common shares for quarter ended December 31st, 1924.

Mississippi River Power Co.—Dividend of $1½ per share on the preferred stock.

Wellman Smith Owen Engineering Corporation.—An interim dividend of 5 per cent. (less tax) has been declared.

Stocks and Shares.

MONDAY MORNING.

CHRISTMAS markets in the Stock Exchange are supposed to be, by tradition, as quiet in the direction of business as they are lively in that of horseplay. This year, however, the insatiable demand of the investor is keeping members busy, and they have, moreover, a good deal of speculative trade in which to employ their energy. The volume of new issues threatens to grow into a glut. Several of the latest comers failed to secure a warm welcome. The Armstrong 6½ per cent. debenture stock was duly subscribed, but the stags got more than they wanted. The price opened at 1 discount, to move up to 5s. discount as the cheapness of the scrip became more appreciated. Colonial loans are faring, however, none too well.

Many scores of Stock Exchange securities were marked ex dividend on Thursday, the last pay-day of the year now ending. In many cases, the deductions were recovered either wholly or in part. Good stock at a reasonable price is still difficult to buy.

Amongst electricity supply shares, those most scarce are the higher-priced varieties, *e.g.*, Kensingtons (which retain their last week's rise of 22s. 6d.), St. James' and Notting Hill deferred. There are supplies of the medium-priced shares to be obtained : 500 City Lights, for instance, at 2½ ; 1,000 County ordinary at 52s. 6d., and 1,000 South Londons at 45s. A couple of thousand Metropolitans are on offer at 37s. 3d., and 500 Charing Cross at 46s. Urbans can be bought in fair quantity at 19s. 9d., Edmundsons at 22s. 9d.

Outside the London group, other shares on offer include :—

500 Bournemouth ordinary at 53s. 6d. to yield	£5	4	6
2,000 Egham & Staines new at 22s. 3d. to yield	£6	15	0
2,000 Isle of Thanet at 18s. 6d.			
2,000 Llanelly Elec. ordinary at 20s. to yield	£7	0	0
5,000 Midland Counties ord. at 22s. 6d. to yield	£4	17	6
2,000 Lancashire Elec. ord. at 25s. 3d. to yield	£5	19	0

The yields are calculated upon dividends paid in the last completed year. The list does not profess to be exhaustive, of course, but it gives a just idea of what can be obtained, and the return that such shares offer on the basis of to-day's prices.

Underground Railway stocks are enjoying pronounced strength. Buyers fasten upon Metropolitan Consolidated as being the stock that possesses the best speculative chance, for the reasons reiterated here last week. The price is up to 82¼. Districts have risen to 56, Central London ordinary is higher at 73. Bus "A" strengthened to 9s. 6d., but the £10 shares at 3¼ are 5s. higher, and Underground Incomes have at last reached three figures, showing a rise to par. These advances have not been reflected in any of the London transport issues, where prices remain very dull. London United Tramways debentures, while nominally 55¼ ex dividend, changed hands down to 50¼ a few days ago, the preference being done at 4s. 6½d. The ordinary are still about threepence per share.

The chairman of the British Columbia Electric Railway spoke very cheerfully at the meeting last week. He regards the outlook as promising, and is well satisfied with the progress which the company is making. No change has occurred in the prices of the various stocks. There is about £2,000 of the ordinary on offer in the market at 112½, which affords a yield of 5¼ per cent., free of tax, on the last dividend of £6 9s. 5d. net. This return is equal to a little under 7½ per cent. gross, taking tax at 4s. 6d. in the £. Anglo-Argentine Trams keep good. Both classes of preference shares are now ex dividend. The Seconds give 10 per cent. on the money at £3 per share.

Mexican Utilities make no headway. Further small declines have occurred. Brazil Tractions regained their last week's decline. Rio Tramways Fives are normally better at 94, and San Paulo Firsts stand at 96. All the animation recently noticeable in Singapore Electric Tramways has now subsided, and the market is quiescent, the price being 6s. 3d. middle.

Great Northern Telegraphs have gone back 7s. 6d. The Eastern group has not moved. Marconis weakened to 30s., sellers being persistent and buyers difficult to tempt. Canadians keep up fairly well at 5s. 6d. The Constantinople Telephone Company issues a notice regarding the deferring of payment upon its obligations and certificates. The £5 shares are quoted at 25s., but business was done in them last week at 18s. 9d. No dividend has been paid since 1913.

In view of this week's removal from the Stock Exchange Official List of West India and Panama Telegraph shares, it may be of rather lugubrious interest to mention that the ordinary last changed hands at 7½d., the first preference at 3s. and the seconds at 2s. 6d. This was in September. All the shares are of £10 each, and are fully paid. The last recorded deal in the company's 6 per cent. debentures took place in July, at 27½.

The feature in our list of Miscellaneous shares is a rise of 3s. 9d. to 52s. 6d. in Babcock and Wilcox. The demand came from the North. Other engineering and kindred descriptions are irregular in price. Edisons at 5s. 9d. are ex dividend. English Electric preference improved to a guinea and Electric Constructions gained 1/16 at 31s. 3d. Rubber shares keep steady, the raw produce again being better, though in the rubber market there is no accession of public business to interfere with the due enjoyment of a Merry Christmas.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923.	Dividend. 1923.	Price Dec. 19, 1924.	Rise or fall.	Yield, p.c.
Brompton Ordinary	1	12	10	1⅞	—	*£5 6 8
Charing Cross Ordinary	1	14	14½	2½	—	6 7 2
do. do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	10	12	87/6	—	6 8 0
City of London	1	15	15	47/6	—	6 6 4
do. do. 6 % Pref. ...	1	6	6	23/6	—	5 2 2
County of London	1	10	15	22/6	—	5 14 1
do. do. 6 % Pref. ...	1	6	6	23/6	—	5 2 2
Edmundson's Ordinary	1	7	7	22/-	—	... ...
do. 7 % Pref.	1	6	6	21/6	—	6 4 5
Kensington Ordinary	5	12	14	10⅞	—	6 10 3
London Electric	1	10	10	33/6	+6d.	5 19 6
do. do. 6 % Pref. ...	5	6	6	5½	—	5 4 7
Metropolitan	1	2½	10	1⅝	—	5 6 8
do. 4½ % Pref.	1	4½	4½	17/6xd	—	5 2 10
Newcastle-on-Tyne Ordinary ...	1	2½	6	22/6	—	5 9 1
do. 5 % Pref. ...	1	5	5	18/9	—	5 6 8
do. 7 % Pref. ...	1	7	7	25/-	—	5 12 0
Notting Hill 6 % Pref.	10	6	6	9½xd	+ ¼	6 4 5
North Met. Elec. 6 % Pref. ...	1	6	6	1½	—	5 6 8
Urban Ordinary	1	—	4	19/3	—	4 4 8
do 6 % Pref. ...	1	5	6	19/6	—	6 3 1
St. James' and Pall Mall ...	5	14½	17½	12⅝	—	6 16 0
South London	1	11	15	2½	—	6 13 4
South Metropolitan Pref. ...	...	7	7	1¼	—	5 12 0
Westminster Ordinary	5	12	15	11	—	6 16 4
Whitehall Elec. Invst. 7½ % Pref.	1	7½	7½	19/3	+3d.	7 16 8

HOME RAILS.

Central London Ord. Assented	Stock	4	4	73	+1	5 9 8
Metropolitan	,,	8½	4	82½	+1	4 17 0
do. District	,,	8	8½	56	+ ½	6 5 0
Underground Electric Ordinary	10	Nil	Nil	2½	+ ½	Nil
do. do. "A" ...	1	Nil	Nil	9/6	+6d.	Nil
do. do. Income	Bonds	5	6	100	+1	*6 0 0

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	105	—	5 14 3
do. Def.	,,	1½	1½	24½	—	6 2 5
Chili Telephone	5	6	6	5⅞	—	*5 4 4
Cuba Sub. Ord.	10	7	7	7	—	10 0 0
Eastern Extension...	10	10	10	17	—	*5 17 8
Eastern Tel. Ord.	Stock	10	10	170	—	*5 17 8
Globe Tel. and T. Ord.	10	10	10	17½	—	*5 16 0
do. do. Pref.	10	6	6	11¼	—	5 7 10
Great Northern Tel.	10	24	22	29⅞	— ⅛	7 9 2
Indo-European	25	7	7	89½	—	*5 6 1
Marconi	1	15	10	1½	— 1/16	6 13 4
Oriental Telephone Ord.... ...	1	12	12	1½	—	*8 8 0
United R. Plate Tel.	5	8	8	6⅛	—	*5 15 5
Western Telegraph		10	10	17xd	—	5 17 8

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	12½	5½	8⅛xd	—	8 19 9
do. do. 2nd Pref. ...	5	5½	6	8xd	—	10 0 0
do. do. 5% Deb. ...	Stock	5	5	73½	—	6 16 0
British Electric Traction Ord. ...	,,	5	5	99½	—	5 0 6
do. do 6% Pref.	,,	6	6	105½	—	5 13 9
Brazil Traction	100	4	4	57	+ ½	7 0 9
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	82½	—	5 13 0
do. do. Preferred	,,	5	9/6	89½	—	*5 7 6
do. do. Deferred	,,	8	199/5	111½	—	*5 16 0
do. do. Deb.	,,	4½	4½	80½	—	5 5 7
Lond. & Sub. Trac. 5 % Pref. ...	1	5	9½	7/-	—	7 2 10
London United Tram. Deb. ...	Stock	4	4	56½xd	—	7 4 1
Mexico Trams. 5% Bonds ...	—	Nil	5	72	−1	6 19 0
do 6% Bonds ...	—	Nil	Nil	56	—	Nil
Mexican Light Common ...	100	Nil	Nil	23	—	Nil
do. Pref.	100	Nil	Nil	54½	−1	Nil
do. 1st Bonds ...	—	5	5	66	—	7 11 5

MANUFACTURING COMPANIES.

Babcock & Wilcox...	1	20	12	2⅝	+ 1/16	+4 11 9
British Aluminium Ord.... ...	1	5	5	28/3	—4d.	5 1 8
British Insulated Ord.	1	15	15	86/3	—	5 9
Callenders	1	15	15	2½	—	5 6 9
do. 6% Pref....	1	6½	6½	23/9xd	+6d.	5 9 5
Crompton Ord.	1	5	Nil	10/-	+ 1/16	... ...
Edison-Swan	£/-	7½	10	5/9xd	—	6 12 0
,, 8% Deb.	Stock	8	8	81½xd	—	6 0 3
Electric Construction	1	10	10	1⅝	+ 1/16	6 8 0
English Electric	1	8	8	19/3	—	5 4 0
do. do. Pref.	1	8	8	21/-	+6d.	5 14 8
Gen. Elec. Pref.	1	6½	6½	23/3	—	5 11 10
do. Ord.	1	5	5	21/-	—	4 16 3
Henley	1	15	15	2½	—	5 6 9
do. 4½ Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	10	5	17/6	—	*5 14 8
Met.-Vickers Pref....	2	8	8	2½	—	6 8 0
Siemens Ord.	1	5	—	23/3	—	4 6 0
Telegraph Construction	12	20	20	26½	—	*4 10 6

*Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances

CHEMICALS, &c.		Price Dec. 22.	Fortnight's Inc. or dec.
a Acid, Oxalic	per lb.	5½d.	...
a Ammoniac, Sal	per ton	£60	...
a Ammonia, Muriate (large crystal)	,,	£32	...
a Bisulphide of Carbon	,,	...	...
a Borax	,,	£35	...
a Copper Sulphate	,,	£25 10s.	...
a Potash, Chlorate	per lb.	4d. to 4½d.	...
a ,, Perchlorate	,,	4½d.	...
a Shellac	per cwt.	£15 15s.	...
a Sulphur, Sublimed Flowers ...	,,	£7 15s.	...
a ,, Roll	,,	£7 15s.	...
a Soda, Chlorate	per lb.	3d.	...
a ,, Crystals	per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ...	per lb.	4½d.	...
METALS, &c.			
b Aluminium, Ingots	per ton	£120 to £125	...
b ,, Wire	per lb.	1/9 to 2/6*	...
b ,, Sheet	,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—			
Grade I	per ton net	£241	£4 inc.
Grade II	,, ,,	£174	£3 inc.
Grade III	,, ,,	£101	£1 inc.
c Brass (rolled metal 2" to 12" basis)	per lb.	1/0½ to 1/0½	½d. inc.
c ,, Tubes (solid drawn) ...	,,	1/- to 1/0½	...
c ,, Wire, basis	,,	10½d.	...
c Copper Tubes (solid drawn) ...	,,	1/1½	½d. inc.
c ,, Bars (best selected) ...	per ton	£96	£1 inc.
c ,, Sheet	,,	£96	£1 inc.
c ,, Rod	,,	£96	£1 inc.
d ,, (Electrolytic) Bars ...	,,	£70 10s.	£3 inc.
d ,, Sheets ...	,,	£143 10s.	...
d ,, ,, Wire Rods ...	,,	£80 10s.	£1 inc.
d ,, H.C. Wire	per lb.	10⅞d.	⅛d. inc.
f Ebonite Rod	,,	2/- to 3/6	...
f ,, Sheet	,,	2/- to 3/6	...
n German Silver Wire	,,	2/3	...
h Gutta-percha, fine	,,	9/-	...
h India-rubber, Para fine ...	,,	1/7½	1½d. inc.
i Iron Pig (Cleveland Warrants) ...	per ton.	£5 2s. to £5 2s. 6d.	...
i ,, Wire, galv. No. 8, P.O. qual.	,,	£25	...
g Lead, English Pig	,,	£44	£2 6s. inc.
g Mercury	per bot.	£12 10s. to £12 12s. 6d.	27/6 to 30/- inc.
e Mica (in original cases) small ...	per lb.	3d. to 3/-	...
e ,, ,, medium ...	,,	4/- to 8/-	...
e ,, ,, large ...	,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings	,,	1/3½	...
p ,, ,, drawn bars & rods	,,	1/8	...
p ,, ,, rolled strip & sheet	,,	1/3½	...
p ,, ,, wire	,,	1/4	...
o Platinum	per oz.	£26	...
d Silicium Bronze Wire	per lb.	1/0½	...
r Steel, Magnet, in bars	,,	8d.	...
n Tin, Block (English)	per ton.	£266 10s. to £267	£9 5s. to £9 10s. inc.
n ,, Wire, Nos. 1 to 16	per lb.	8/11	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

London Traffic Advisory Committee.—The Committee to advise the Minister of Transport upon all questions affecting traffic in London and the Home Counties has been constituted. The members are as follow:—Mr. A. L. Dixon, C.B., Sir George H. Hume, M.P., L.C.C., Mr. J. R. Pakeman, Sir Henry Jackson, M.B., M.P., Sir Henry F. New, Col. C. Pinkham, O.B.E., Mr. K. E. Chalmers, Mr. W. G. Davie, Chief Constable A. E. Bassom, O.B.E., Capt. Sir W. Nott-Bower, K.C.V.O., Sir Henry P. Maybury, K.C.M.G. (Director-General of Roads), Mr. J. Cliff, Mr. B. Smith, M.P., Mr. A. O'Leary, Sir Herbert A. Walker, K.C.B. (general manager of the Southern Railway), Mr. G. A. Dutfield, Mr. F. Pick (assistant general manager, Underground Railways and L.G.O.C.), and Mr. F. W. Prowse. The secretary is Mr. J. S. Pool-Godsell, M.B.E., Ministry of Transport, 7, Whitehall Gardens, S.W.1.

The Committee held its first meeting on December 18th, when the members were addressed by the Minister of Transport (Lieut.-Col. W. Ashley). Sir Henry Maybury was elected chairman of the Committee.

City Gas Explosion.—As a result of a gas explosion last week at the corner of St. Dunstan's Hill and Great Tower Street, seven persons were injured and taken to St. Bartholomew's Hospital. The injuries in most of the cases were not serious, and after receiving attention the patients were discharged, with the exception of one man, who had to undergo an examination by X-rays.

The explosion took place while some telephone engineers were working in a manhole. There had previously been a strong smell of gas. Suddenly there was a big explosion; a great flame shot out and a portion of the roadway was blown up. Several passers-by were thrown down and injured, and two of the postal telephone employés who were at work also received injuries.—*The Times*.

Some Psychological Aspects of Engineering Inspection.

By FRANK H. MANN, A.M.I.E.E.

If I were asked to name the attributes which should go to form the mental equipment of the engineering inspector and to specify the order in which such attributes should most desirably be cultivated by the tyro, the first place would unquestionably be given to power of psychological perception. It may be true that proficiency in this respect arises rather from the possession of an inherent faculty than as a result of any degree of application; and in this case no one without the gift can hope to attain the first rank. It is probable, however, that if the germ exists it can be cultivated by the intelligent use of experience, suitably spiced by a dash of philosophy.

Whether the faculty be native or acquired, it stands as an invaluable first aid to the inspector who aspires to rise only a shade above the dead level of the automaton. Without its help the inspector must be largely at the mercy of unscrupulous practice and misleading contrivance.

For the second place the virtues of moral courage and technical ability strive level-breasted for mastery; but whichever is acknowledged, a decision is rendered difficult without a knowledge of the subject's mentality. Moral courage connotes firmness of purpose; and firmness of purpose unrelieved may easily be the reflection of stupidity. The inspector must be a fighter to his finger tips; but while he must defend every day what he knows to be right principles, his attitude must at all times be tempered with sufficient breadth of vision to recognise that deviation from the strict letter of his specification may at times be permissible, or even commendable, and that alternative courses are not always to be damned.

As far as the other claimant to second place is concerned, it may be said that sheer technical ability needs only the leavening introduced by a realisation of sound practices; but as the scope of activities of the general inspector is almost without limit, it would seem that this corollary is of the first importance.

Stern disciples of the "Looks right—is right" school will probably call down wrath upon me for the omission of common sense in the first rank of desirable qualities. I offer no excuse for its omission. It is an attribute considerably over-rated by those who are compelled to rely on it largely in the absence of a nicer engineering discrimination.

It is possible that the same school would also take me severely to task for daring to suggest a dilution, in the form of an occasional concession, in the high virtue of moral courage. That the latitude I allow is aimed not against moral courage but against a stupid inflexibility hardly need be argued.

In writing of our inspector's qualifications, I mentioned psychological perception. It would have been well, perhaps, had this attribute been coupled with the possession of unbiased and detached mental poise, since ability to maintain the latter were perhaps of higher importance still.

Leaving out of consideration the—we will not say calculated—effect of physical conditions, there arise for consideration endless situations for the use of psychological perception and the display of right mental poise on the part of the inspector. In addition to the ability to gauge his man's honesty of purpose, or assess the degree of a moral obliquity intuitively sensed, he must be prepared for an intellectual contest with an adversary of friendly guise in whom the exercise of dissimulation has been carried to a fine art. The tactful distraction of the inspector's attention from the issue under consideration to a point of comparative triviality, or from indifferent material to superlative examples of other work, forms a trap for the unwary which may require considerable penetration to detect.

The majority of inspectors who have profited from their experience will be able to recall the circumstances of finding, in a bulk inspection, a few articles with a sufficiently pronounced disparity in some respect or other to leave no doubt as to the course to be taken; the effect on the mind of rejecting the outstandingly defective articles being such as to mask the lesser defects of a large proportion which, had the worst examples been absent, might have been sufficient to lead to the rejection of the whole.

The inspector's responsibilities do not end with the act of inspection or testing of plant or material; it is part of his duty to visualise any possible means by which, as a result of either carelessness or design in the subsequent disposal of the articles, his efforts might be rendered abortive.

In shaping his attitude where circumstances seem to warrant suspicion the highest degree of discernment and tact is called for, and it may not be out of place to warn the over-zealous that, alive as they must be to any form of duplicity, it is possible for suspicion to be carried too far, in which case it may defeat its own ends and become needlessly provocative.

An attitude of suspicion should be controlled by a fair regard for the reasonable probabilities of the case, and as an example of this I might mention the instance of the inspection of apparatus of standard pattern but of specified quality of material or finish.

Assuming that individual stamping may be difficult or impracticable, misgivings as to the subsequent disposal of the apparatus would in the experienced mind be largely allayed by the reflection that the articles having been manufactured to conform with an exacting specification, there would be little likelihood of any purpose or interest being served by allocating them elsewhere or substituting articles of inferior quality.

Illustrating the necessity for correct mental poise on all occasions are the cases in which the inspector finds himself falling into a well-organised routine of inspection—the highly-developed system, where almost before one has glanced at the material, one is carried in a whirl through examinations and tests galore. Nothing is more satisfying to the experienced inspector than for things to be hustled; the danger arises when a man with less capacity for gripping a situation finds himself an objective in the process.

The effect of weariness is one to be carefully guarded against. Hours of examination of articles, devoid of faults, each one of which takes tedious minutes in being opened up, strongly incline the inspector to cry "enough," and to pass the few remaining. I am fairly certain that not a few will bear me out when I say that if a fault exists, it will be disclosed in that last half-dozen. Such tests of mental stamina are frequently met with in a wide inspecting practice, and in most cases they hinge upon the same conditions of weariness as are induced by a series of fruitless examinations.

The subconscious influence of a friendly atmosphere and hospitality at a works is perhaps one of the most difficult with which the young inspector may have to contend in shaping his conduct to the problem in hand. It is not within the scope of this article to analyse an attitude which, one would fain believe, in most cases springs from sheer good feeling. It is none the less true, however, that the effect of liberal hospitality on a susceptible mind may be otherwise than conducive to a strictly impartial attitude. The inexperienced may

be subjected to a similar effect from witnessing the preparations which have been made to satisfy, say, special tests called for. The writer is aware of a case where the testing conditions, while complying strictly with the letter of the specification, were such as to render the test abortive in one important particular. Neglect of this, while not offending the letter of the specification, would certainly be condemned from consideration of good practice. Discovery of such a fact would depend in a great measure upon how far the inspector's engineering perceptions had been affected by his appreciation of the efforts and expense that had obviously been made to fulfil the specified requirements.

It may be urged that no special preparation is required to cope with such cases; that singleness of aim and purpose should carry the real engineer past such pitfalls. Possibly so, but not being supermen, most of us are subject to impressions by which we may be subconsciously influenced; hence the sharp watch that must be maintained on the drift of our attitude from the effect of appearances, whether undesigned or contrived by the astute manipulation of external aspects.

Hydro-Electric Power in Spain.

Economic Developments to be undertaken in Various Directions.

(By Our Special Correspondent in Spain.)

ALTHOUGH Spain does not figure prominently among the countries of the world possessing the greatest amount of undeveloped water power, the largest fall being that of Capdella, 830 metres (2,723 feet), the amount of energy that it is possible to generate has astonished those who have made a close study of the subject. Spain is to-day practically pledged to avail herself of the potentialities of the considerable volume of wasted energy of which she stands naturally possessed, and in this important enterprise the enlistment of British capital and engineering capabilities has been decided upon. This is no new movement, however, for during many years past the principal hydro-electric enterprise has been that known as the Barcelona Traction, Light, and Power Co., incorporated under the laws of the Dominion of Canada, and the operations of which (although less remunerative than at one time was anticipated, necessitating, in fact, a reorganisation of the company's finances) have proved a great boon to the kingdom. There are promises of more ample reward for this enterprise in the not-far-distant future. Incidentally, it may be mentioned that the Barcelona Traction, Light, and Power Co. commenced operations about 1913, at which period its gross earnings did not amount to more than £40,000; in 1921 the revenue had been increased to £568,200, and in 1923 to £706,500.

It may be said without exaggeration that the market for power in Spain, taking the country as a whole, is one of the most promising. It would be no less accurate to state that there are few better plants anywhere; the chief installations, such as those in Barcelona, Madrid, &c., vie with any to be found in either the Old or the New World. Encouraged by these facts, the Directory, under the presidency of the Marquis de Estella, recently appointed a committee of experts to study the proposals of a number of industrial enterprises, more particularly the Sociédad Española de Industria y Tracción Eléctrica, for the industrial exploitation of the kingdom by means of railway construction; the utilisation of water power for the production of electricity; and the building of blast furnaces and factories for the manufacture of raw materials to be obtained in the country, all operated by electric power.

While no complete list of electrical installations is now available, the Ministry of Public Works has, for some time past, been engaged upon compiling a directory from which it will be able to derive this and much other valuable information. Private estimates place the number of installations in the kingdom at 140, with 700,000 h.p. in operation, and a further 150,000 h.p. in construction. On the other hand, an estimate made by the Unión Eléctrica gives 5,000,000 h.p. as a reasonable figure possible of attainment.

The great Spanish rivers, few of which are navigable, gather the greater part of their waters on the central plateaux at altitudes ranging from 6,000 to 1,500 feet. The waters run in deep-cut channels, thus offering exceptionally favourable opportunities for their employment in the generation of electricity. The rivers Tagus, Douro, and Guadalquivír (pronounced Wa-dal-kee-veer) are the three principal sources, the volume of the first-named varying between 12 cubic metres and 1,000 cubic metres per second at times of extreme drought and flood periods. The Guadalquivír has been known to flow from 10 to 5,000 cubic metres per second, so that it is necessary in this case to regulate the flow by artificial means. These have already been undertaken to a considerable extent. Unlike other watercourses in Spain, this river does not rush along precipitately, but spreads itself over a broad bed. Thus, the control scheme embraces the construction of a number of canals, particularly between the cities of Córdoba and Seville, where 11 dams will be erected providing heads of water of from 20 to 25 feet, destined to harness 100,000 h.p., and in this manner irrigate an immense area of land and create a new waterway between the two cities.

In the case of the Douro river, which forms the frontier between Spain and Portugal for 60 miles of its course, flowing between steep banks it receives a number of tributaries on its left bank (Spanish territory). Engineers state that, within the length of 60 miles, the Douro could be made to yield 300,000 h.p., and detailed schemes are now being prepared with this view. Unfortunately, before anything practical can be arrived at, an agreement will have to be made with the neighbouring State of Portugal; and here political matters remain in so chaotic a condition that anything like a permanent agreement between the sister states is out of the question. On the other hand, it is thought that the possibility exists of diverting the waters of the Douro before they reach the frontier and of returning them by tributaries so that the Portuguese would suffer no loss.

The Rio Durcal, in the Province of Granada, has already been made to yield a considerable amount of power. Here there is a fall of 758 metres (2,487 feet), forming the second most important power fall in the kingdom. It is exceeded only by the fall of Capdella (830 metres), already referred to. The water flows from the Sierra Nevada, and is impounded in a reservoir of 4,000 cubic metres capacity (140,000 cubic feet). At present the flow utilised is 400 litres per second (14 cusecs), but it is proposed to increase this supply to 3,000 litres per second in the near future. The reservoir is fed by a channel constructed partly in open cut and partly in tunnel. The length is 9,580 metres (31,420 feet). A second reservoir, with approximately the same capacity, has been formed near the outlet of the power-house in order to safeguard various established water-rights, including some from old irrigations. Thus, whatever be the rate at which the power water is being used, the *regimen* of the river is maintained. The pressure-pipe from the upper reservoir to the

power house is 500 mm. in diameter (19½ inches), laid in lengths of 12 metres (39 feet). The wall thickness ranges from 7 mm. to 23 mm. (9/32 to 29/32 inch). There are no expansion joints, and the pipe is buried throughout its length of 2,136 metres (7,000 feet).

The electrical equipment consists of two groups of turbines and generators, each of 1,700 kW, working at 3,000 volts. Two groups of transformers raise the pressure, in the one case, to 25,000 volts for transmission to the network of tramways and electrical railways which serve the city of Granada and its suburbs; and, in the second instance, to 60,000 volts for transmission to Almeria for general purposes. The railway between the city of Granada and the suburb of Durcal (35 km. in length) is also included in the system of supply. For this purpose a battery of accumulators, the largest in the kingdom, has been installed. It comprises 580 double cells, with a capacity of 444 ampere-hours at 1,200 volts. This battery of accumulators cost 270,000 pesetas (roughly £8,000), while the cost per horse power installed has worked out at 850 pesetas (£26). The whole of these works were designed by, and carried out under the direction of Dr. Alfredo de Velasco.

Railway Electrification.

Among the more important electrical transport enterprises which have already taken form is a railway between the capital, Madrid, and the important port of Valencia. This line will be about 350 km. in length, and will be double tracked. The scheme comprises the development of hydro-electric power necessary to operate the line as well as to provide electricity for a number of mines and factories, in addition to pumping in connection with certain irrigation schemes. The enterprise is notable for the fact that it constitutes the first electric trunk line to be constructed in Spain. Naturally the scheme has met with considerable local support, since not only will it form the most important undertaking of its kind launched in the country for many years, but also it will serve to open up a territory, rich in minerals and in agricultural products, hitherto entirely devoid of communications. When the electrification of this line was under discussion, the question of the voltage proved an exceedingly difficult one to solve. Its importance really lay in the fact that upon the ultimate decision arrived at depended the future electrification of many other Spanish railways. A number of engineers favoured 3,000 volts, while a considerable minority advised a much lower voltage. At the time of writing the question has not been definitely decided so far as the Madrid-Valencia line is concerned.

A second enterprise of hardly less importance is the Ripoll-Puigcerdá (or Trans-Pyrenean) line. This calls for a length of electrified line opening up the Puerto-de-Pajares on the system between León and Gijón. The line is some 60 km. in length, rising to a height of 1,200 metres. There are two long tunnels, having a total length of 6 km., piercing the Pyrenees. Eight stations have been, or will be erected. The line, which has been undertaken in connection with the Franco-Spanish agreement of 1904, will eventually connect with the French line at Aix-les-Termes, and serve to considerably shorten the journey between Barcelona and Toulouse. In fact, there will be a saving of 120 km.

The Rhine-Main-Danube Canal.—The Munich correspondent of *The Times* reports that the work of constructing this huge waterway is progressing rapidly. The undertaking is being carried out by a company whose headquarters is at Munich, and its object is to make a transport route *via* Cologne, Mainz, Frankfort, Aschaffenburg, Bamberg, Braila, Galatz and Sulina, over 2,000 miles in length, and navigable for ships of 1,500 tons. The plan includes the erection of 33 power stations capable of producing about 1,500 million kWh per annum. The greater part of the share capital is in the hands of the German Government, the Governments of Bavaria and other German States, a large number of towns, groups of industries, and commercial syndicates. The German Budget for the current financial year provides 12,000,000 gold marks for the scheme.

Hydro-Electric Development in India.

(From a Correspondent.)

THE State of Mysore has shown itself to be very progressive in the matter of developing hydro-electric projects. It has already carried out the Shivasamudram and Krishnarajasagar projects which have considerably benefited the industries in Mysore, Bangalore, and the Kolar Gold Field. There is still, however, immense scope for development. The question of harnessing the Gersoppa Falls for the generation of electric power has long been under the consideration of the Government. Recently a special survey of this important project with reference to the power prospects, &c., was completed. The proposal provides for a reservoir about 10 miles above the Falls and a take-off dam about three miles above the Falls, with canals running behind the hill on the Mysore side, to a forebay about 1½ miles downstream. The power station will be located at the bottom of the river gorge about 1½ miles down stream from the Falls. The proposal also provides for the discharge over the Falls of the normal average discharge in the river, the power station being operated with water stored during the flood season. The scheme entails a very large outlay which, if carried out, will open up the Malnad to great industrial enterprise and will enable the Bhadravata Iron Works to develop a number of subsidiary industries. Besides developing the Gersoppa Falls there is also a proposal to utilise the Mekadatu waters, in respect of which Madras has ceded its rights to Mysore on certain conditions.

The Madras Government also intends to pursue a forward policy in the matter of hydro-electric development. It has already sanctioned suitable grants for the investigation of the Pykara project in the Nilgiris, as well as of the Papnasham project in the Tinnevelly district. It is proposed to utilise the power generated under these schemes for the electrification of the railways. It will also be possible to run a paper mill and a match factory near the Papanasam Falls, in the vicinity of which lie extensive forests of excellent bamboo proved to be quite suitable for the manufacture of pulp.

Electricity for Aden.

The foundation stone of the Aden Power Station was laid recently by the Political Resident of Aden, who, in performing the ceremony, gave a short history of the project. To finance the scheme the Government of Bombay sanctioned a loan of Rs.10 lacs, and it is estimated that about Rs. 2,12,000 will be obtained each year by the sale of energy. The scheme was prepared by a London firm of consulting engineers. Three-phase current will be generated at 6,600 V, 50 cycles, and will be supplied to consumers by a 3-phase, 4-wire system at 230 volts. The maximum charges to consumers which are permissible under the licence are:—(1) For general supply purposes for lighting, fans and heating, six annas per kWh; (2) For power purposes four annas per kWh, with a minimum monthly charge in each case of Rs. 3-8-0. The tender of Messrs. Crompton & Co., Ltd., for the power house and its plant has been accepted by the Executive Committee. The contract provides for the installation of three Vickers-Spearing boilers and three 250-kW turbo-alternators, together with the necessary subsidiary machinery, to be delivered at Aden in eight months. The turbines will be manufactured by Messrs. W. H. Allen and Sons and the alternators by Messrs. Crompton. A managing engineer is investigating the transmission and distribution system on the spot, and it is hoped that the scheme will be in operation by September, 1925.

Wireless Humour.

By "ALPHA."

SOME time ago we had occasion to enter the local shop selling photographic and (lately) wireless goods. It was the first time we had been to this particular shop since the broadcasting boom, and our shopman was known to us only as a knight of the camera. We commented on the fact of so many photographic dealers selling radio apparatus, and he heaved a sigh overboard and said: "Ah, well, kindred subjects, kindred subjects." Here he began to expand, and wishing to show himself better initiated into electrical matters than his brother photographers he at once commenced a technical dissertation.

He picked up two articles of (alleged) ebonite. One was a valve holder, the other a tapped knob. "Now you wouldn't think there was much difference in the ebonite of these two, would you? Well, this one's 3.9 and this one 2.3."

Here we began to look blank, so he hastily added: "The sufficiency." Repressing a broad smile, we stated that still we did not comprehend. We were favoured with a pitying smile as he went on: "This one has a sufficiency of 3.9, and that one of 2.3." Here we added: "Oh, you mean the insulation resistance, 3.9 megohms?" "No, the sufficiency." This could not last any longer, we had other shopping to do, and so we endeavoured to change the subject. Our worthy was not to be baulked, however, and carried on. "This one loses 3.9 per cent. of its power." "Oh-h!" we finally interjected, wondering if the leg-pulling was by him or if it had previously been passed on to him unsuspectingly.

We decided to leave him to his "sufficiency," and thankfully awaited his next remark—on ebonite. "Ebonite is the best insulator there is, perfect," he said, "far better than mica (pronounced "micca")—know for a fact." We gently hinted that certain other things besides "micca" had higher dielectric strengths than ebonite, but he would not have it. Oh, no, "micca" was no good, ebonite was the only real insulator known, and all our remarks were considered as the babblings of an infant.

Here we had an interruption, a photographic customer arriving. On disposing of him, our lecturer returned to the serious business of instructing us. Unfortunately, however, he was still thinking of his last customer, and so we got in the question: "What do you think of the A.R.D.E. valve?" and thinking that his remark would be interesting we added: "What do the letters represent, by the way?"

Still thinking of his last customer, he scratched his head and replied "A.R.D.E.—oh, er, um, Anastigmat, Rectilinear, Double-extension." His next remark was drowned in the noise of a show case which was hastily kicked over to hide our merriment.

Leaving details as unworthy of our talk, he volunteered the information that he "knew something about it now, oh yes, two electricians up at the metal works are a'learnin' me, two nights a week; they know all about it—been electricians all their lives." He further told us some really good information on the matter of radio sets generally, all of which was imparted to him by his electricians "up at the metal works."

"Never solder your aerial wire, no, never no good, the solder deadens the current," he explained. "Don't have bright wire for your aerial, have it enamelled or dulled in some way. Lightning is attracted by the glare of bright wire, so you might get the apparatus burnt out by lightning."

This was a bit too bad; our ancient dealer had had it all his own way so far, and we thought it time to get a bit of ours. "Do you know Meg Ohm?" we queried. No, he didn't, and he didn't see what that had got to do with business. "Oh, we thought you might have known her or Milli Ampere, they were always around where radio amateurs were." We continued: "A friend of ours, at a technical school, used to come home and tell us stories of 'gausses.' Maiden aunts would beg him to desist, except at Christmas time, when it was considered fashionable." Our poor friend could get no one to credit the fact that "gausses" was not a local dialect for "ghosts," but meant much to electrical designers.

Here we noticed some "anti-capacity switches" for sale, and proceeded to inquire as to the meaning. "Oh, they're made of anti-capacity metal" was his confident reply, in all seriousness.

We next told him a remark which had been made by a competent mechanical engineer, who, alas, was not exactly up-to-date on radio matters. On discussing the possibilities of radio with him he said he "didn't think that a satisfactory engineering job could be made of the coherer." This was years after coherers had been dumped overboard, and progress is rapid in these days. Our photographic-cum-radio dealer did not see the point of this, coherers being far before his time, as a radio enthusiast.

However, we left him pondering over it, probably wondering how he could impart it to his two professors "up at the metal works."

Notes on the Belgian Congo.

THE following information regarding the trade and development of the Belgian Congo is extracted from a recent report to the Department of Overseas Trade by Mr. C. K. Ledger, British Consul at Boma. (Stationery Office. Price 1s. 6d. net.)

The Katanga province is one of the most important producers of copper in the world, and the concession to exploit the deposits is held by the Union Minière du Haut Katanga. The production has steadily increased; in 1920 it amounted to 18,961 tons, in 1921 to 30,464 tons, in 1922 to 43,552 tons, and in 1923 to 56,577 tons of unrefined copper. Production is facilitated by the lime and ironstone deposits which are near at hand. The exports in 1922 were as follows:—Copper ore 9,073 kg., valued at 1,030 fr.; copper 43,273,273 kg. (133,151,861 fr.). The Union Minière is preparing to erect hydro-electric plant to supply energy for its mining and other operations. The installation of large hydro-electric stations on the Congo River between Leopoldville and Matadi or tributaries in that area would at once enable the Colony to go ahead instead of being tied and restricted by a railway which can only transport 6,000 tons each way per month. Apart from the electrification of the railway, which is projected, the energy could be used in the work of reconstructing the line.

In 1922 the exports of rubber (grass, wild vine, and plantation) totalled 1,109 kg., valued at 3,303 fr., a considerable advance on the previous year's figures. The exports of gum copal were 13,909,609 kg., valued at 15,370,118 fr.

Uranium was discovered at Chinkolobwe by the Union Minière, and in 1922 238 tons of this material was exported to Belgium to be treated at the works at Oolen, which were completed and started work in 1921. In 1923 there was exported 478 tons of uranium, and the Oolen works produced four grammes of radium per month.

A list of the principal imports during 1922, which is given in an appendix, shows that the total value of imported electrical machinery was 1,847,650 fr.; of this the United Kingdom supplied the equivalent of 339,990 fr., and Belgium goods to the value of 1,119,771 fr.

There are telephone services at Boma, Matadi, Thysville, Leopoldville, Coquilhatville, and Elisabethville. The interior relies on the radio system, which is at present not in a position to give reliable service. The Government is making efforts to improve the radio installations and to build new ones at Elisabethville and Stanleyville. A new station was opened last July at Illbo, in the Kasai Province.

As regards communications, land lines have been or are being laid, the chief of which are the Kinshasa—Coquilhatville; Banana—Cabinda frontier; Buta—Niangara; and the Kilo—Irumu—Uganda frontier.

Gas and Electricity for New Houses.—At a recent meeting of the London County Council a report was presented upon the media to be used for lighting, heating and cooking in 535 tenements which are to be erected at the East Hill Estate, Wandsworth, by the Housing Committee. The Wandsworth, Wimbledon and Epsom District Gas Co. had offered to install gas cookers, free of cost to the Council, if two gas-lighting points were allowed. The County of London Electric Supply Co., Ltd., offered to provide the necessary mains and services subject to the wiring by the Council of the whole of the houses for lighting. After some discussion it was decided to accept both offers.

Electrical Temperature Control.

Some of the Steam Fittings Co.'s Products.

THE almost universal availability of electrical energy nowadays renders its utilisation for automatic temperature control, in many cases, extremely convenient. Its obvious application is to the control of electrically-heated appliances, such as melting furnaces for type metal, water heaters, &c.

Electrical temperature control appliances, unless intended for extremely small amounts of energy, must necessarily consist of at least two portions: that is, the heat-impulse device making and breaking a contact to control a solenoid for the electromagnetic operation of a switch, a valve, an automatic starter, or similar mechanism. The device must be simple, robust, and not liable to get out of order in prolonged use without skilled supervision, the portion which is liable to give most trouble being the make and break. Unless a quick-break arrangement is resorted to, which complicates the construction considerably, it is essential that the energy passed between the contacts should be so small that it is not liable to cause injurious sparking.

The Steam Fittings Co. has found by exhaustive tests that it is not advisable to load the contact with more than 0.05 amp. at 220 volts. The impulse device which the company is using is a dial thermometer with an electric contact, as shown in fig. 1, the characteristic feature being that the contact is operated direct from the thermostat and is entirely independent of the indicating mechanism for the temperature; therefore it is claimed the accuracy of the latter can in no way be affected by the contact device. The movement of the thermostat over the whole range of the dial is comparatively small, so that the contact can be set without difficulty for any point over the whole range of the instrument.

The thermostat itself is of well-known "Samson" type, in which the pressure set up by the expansion of the contained liquids compresses a seamless flexible metallic tube joined to the head of the container at one end and closed by a cap at the other end; a rod fastened to the cap and passing through the inside of the tube, being guided in the head, transmits the movement. Solenoids absorbing not more than about 10 watts cannot operate heavy mechanism; only small clapper switches and small valves can, therefore, be actuated by such solenoids directly. For switches above 10 amps. for large valves as well as for the operation of starters, the solenoids actuate relay switches only, which, in turn, handle the main circuit. As the relays can be loaded up to 10 amperes, it is possible to control large amounts of energy in this way.

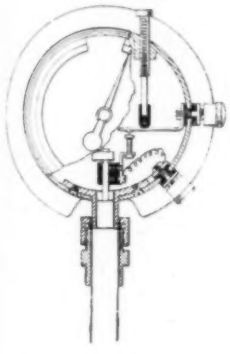


Fig. 1.—"Samson" Dial Thermometer.

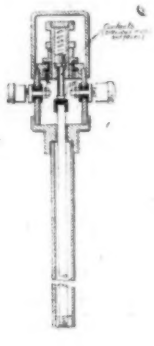


Fig. 2.—High-Temperature Thermo-Contactor.

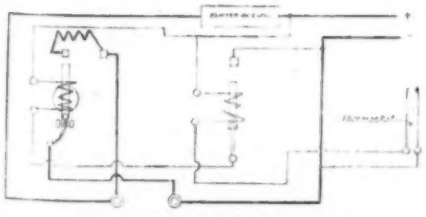


Fig. 3.—Diagram of Connections.

For high temperatures the thermostat is an all-metal thermo-contactor, fig. 2, the insulation consisting of mica and micanite throughout, while fig. 3 is a diagram of the connections for the various units. The clapper switches have no special features; where, instead of electrical resistance heaters, steam- or gas-heated appliances have to be controlled, the same contactors are used and made to actuate the solenoids of electrically-operated valves through relay switches. For operating the valve by alternating current a clapper with suitable arms and links is used, as shown in fig. 5, which illustrates a single beat gas valve. With direct current, direct-pull solenoids can be used, and for large valves and high steam pressures indirect operation is resorted to, the solenoid controlling the pilot valve being made to actuate a main valve by the steam pressure direct.

The electrical method is also applicable to the automatic control of humidity; fig. 4 shows a humidity controller consisting of a wet and dry bulb dial thermometer with contact apparatus to actuate the valve controlling the spray which will maintain within narrow limits constant humidity at varying temperatures. In the construction, use is made of the fact that the difference between wet and dry bulb temperatures at a fixed rate of humidity varies approximately in a definite ratio, the ratio being embodied in the levers actuating the make and break of the valve solenoid circuit. At different percentages of humidity the ratio between the wet and dry bulb temperatures changes, and provision is made in the contact apparatus for changing the lever ratio according to the different percentages of humidity required. The contact apparatus in this instrument is also entirely independent of the indicating mechanism of the thermometers.

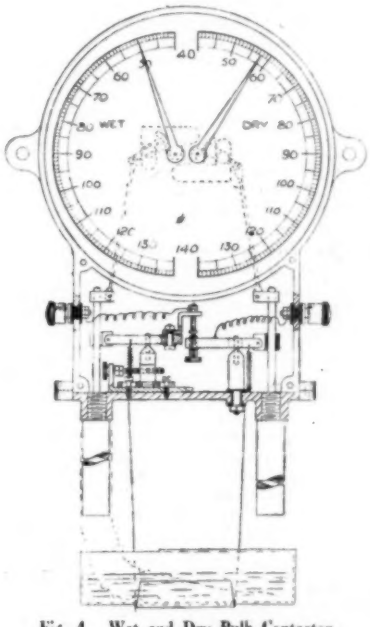


Fig. 4.—Wet and Dry Bulb Contactor Thermometer.

Fig. 5.—A.C. Clapper-operated Valve.

Fig. 6.—Sub-station Overheating Contactor.

Contactors for operating trip gear for switches in automatic sub-stations in the event of stator windings overheating are somewhat differently constructed, as shown in fig. 6. A bulb embedded in the rotor windings is connected by means of capillary tubing to a pressure-operated portion similar to the thermostat described above. The latter actuates a lever having a forked end which operates the contactor, which can be adjusted within desired limits, and is so designed that it can be set for a definite interval between make and break.

Radio in French Morocco.—The removal of the restrictions upon the possession and use of radio receiving sets has opened a small market in French Morocco. One French manufacturer is already represented in Casablanca.

Extremely Intense Magnetic Fields.

Some Account of Dr. T. F. Wall's Experiments.

DR. T. F. WALL, A.M.I.E.E., of Sheffield University, whose endeavours to release atomic energy have received considerable prominence—almost undue and undesired prominence in the daily Press, due to a lack of understanding of the real problem—lectured on what he is doing on December 15th before a meeting of the Chemical Society of the Royal College of Science and the Mathematical and Physical Society of the Imperial College of Science. Prof. Rankine presided, and a number of questions were put to Dr. Wall at the close of the lecture. Among those present was Mr. W. M. Mordey, who showed great interest in Dr. Wall's experimental work, and his contribution to the discussion eventually developed into a little semi-confidential chat with the author at the back of the lecture table. The large number of daily newspaper representatives who were present—presumably in the hope of hearing something sensational in the way of what is going to happen to the world when Dr. Wall or somebody else "explodes the atom"—appeared rather to embarrass the officials of the two societies concerned. One speaker in the discussion attempted to draw Dr. Wall on this point, but the reply was severely non-committal; Dr. Wall said he was not going to prophesy anything, but would wait and see. Mr. Mordey suggested that the change in the curve of magnetisation mentioned by the author at the close of his lecture might be brought about solely by a change of temperature, from which view Dr. Wall rather disagreed, although he confessed that he was not prepared with a definite statement as to what might be the cause.

In the course of his lecture Dr. Wall said that the prime purpose of the experiments which he had undertaken at Sheffield University was an attempt to disturb the electronic orbits of the atoms of matter, so that some or all of the vast stores of energy locked up in the atomic structure might be released. He was quite well aware that the practicability of that aim had been received in some quarters with a good deal of incredulity, partly, no doubt, owing to an incomplete knowledge of what the plan of experiment really was. He hoped, however, in the calm atmosphere of such a meeting as that to be able to indicate that the plan of experiment was not likely to be barren of result, as he would be able to submit evidence in support of the view that results of far-reaching importance had already been obtained.

The experiments were commenced in the early part of this year, but before entering upon an account of the experimental work it would, he said, be useful to briefly note the generally accepted views concerning the electronic structure of the atom and the effect on the electronic orbits of an externally-impressed magnetic field. An atom of any element comprised a minute nucleus of positive electricity and one or more electrons which circled round the nucleus like planets round the sun. An atom of hydrogen, for example, in its normal uncharged state comprised a nucleus of one positive unit charge and an electron revolving round it at the enormous speed of about 1,500 miles per second. An atom of gold comprised a nucleus of a net positive charge of 79 units and 79 electrons circling round it. An atom of mercury contained a nucleus with a net positive charge of 80 units and 80 electrons revolving round it. The structure of the nucleus determined the nature of the element to which the atom belonged, *i.e.*, the amount of the effective net positive charge of the nucleus determined what the element was. If the amount of that positive charge of the nucleus could be changed, the nature of the element would be changed in consequence; it was believed that it was in that way that Prof. A. Miethe, in Germany, had been able to transmute mercury into gold. He passed an intense electric current through mercury vapour contained in an exhausted vessel, and on analysis the deposit was found to contain gold. It was thought that a number of the atoms of mercury vapour had each been penetrated by an electron from the electric current, and that each such electron, having reached the nucleus, reduced its net positive charge from 80 to 79 units, thus converting the atom of mercury into an atom of gold.

If an electron moving in an orbit near the nucleus was expelled out of its path, a large amount of energy would be released. If the nucleus itself could be attacked and broken up, the whole of the atomic energy would thereby become available. The experimental undertaking on which Dr. Wall was now engaged had three more or less fundamental features, *viz.*:

(1) A means for producing very intense magnetic fields by the discharge of large capacity, high-voltage, static condensers through a suitably designed solenoid immersed in oil.

(2) A motor-driven oscillating switch which, when in contact on one side, put the static condensers on charge, and when in contact on the other side, discharged the condensers through the oil-immersed solenoid.

(3) The use of a specimen of magnetic material, of which the magnetisation curve was known, that was inserted in the solenoid so that the intense magnetic field produced by the condenser discharge current was impressed on the specimen.

The use of large capacity, high-voltage, static condensers permitted of the generation of extremely heavy currents and when a suitable time interval was allowed between successive discharges, no difficulty from overheating of the solenoid had been experienced with the greatest currents yet obtained, *viz.*, more than 40,000 amperes through a solenoid wound with No. 16 S.W.G. wire, the normal current carrying capacity of which was only about 13 amperes.

Showing a slide of a typical condenser-discharge current for a circuit containing inductance and a resistance of relatively small value in series, Dr. Wall said that, in view of what he was going to say, there were certain special features of that discharge-current wave which it was desirable to emphasize, *viz.*, (*a*) the ratio of the peak value of successive half-waves was the same for any two successive half-waves; (*b*) the time occupied by the first half-wave was the same as the time occupied by the successive half-waves. A slide was then shown of the discharge-current curve when the condenser was discharged through a solenoid wound with 25 turns per c.m. length. Here it was pointed out that Dr. P. Kapitza had recently given details of a method used by him for producing strong magnetic fields by discharging batteries of accumulators through a solenoid. However, it would appear that Dr. Kapitza did not expect to be able to obtain magnetic fields of an intensity greater than 250,000 gausses, whereas the method which he (Dr. Wall) had been using had already given 1,400,000 gausses and with the new arrangement which would soon be put into operation he confidently anticipated obtaining 10,000,000 gausses.

Oscillograms were then shown indicating current values as follows:—first peak value, 44,000 amperes; second peak value, 43,000 amperes; third peak value, 21,200 amperes; and fourth peak value, 12,500 amperes; those values being much greater than those calculated from the known constants of the solenoid coil already referred to as wound with 25 turns per cm. length. Since the solenoid was so wound, it followed, said Dr. Wall, that the first current peak produced a magnetic field of an intensity of 1,390,000 gausses in the central part of the solenoid. When that oscillogram was taken, a specimen of stalloy steel was inserted in the core of the solenoid and an examination of the oscillograms brought to light some very remarkable facts, as follows:—

(*a*) The time occupied by the first half-wave was only about half the time occupied by the successive half-waves.

(*b*) The peak value of the second half-wave was about the same as the peak value of the first half-wave.

(*c*) The peak value of the first half-wave was very much greater than the value calculated from the constants of the circuit and the voltage—2,000 volts—to which the condensers were charged.

(*d*) The frequency of the wave, *after the first half wave*, corresponded to the value as calculated from the constants of the circuit.

(*e*) The logarithmic decrement of the wave after the first cycle agreed with the calculated value of the inductance and the measured value of the resistance.

Facts (*a*), (*b*) and (*c*), continued Dr. Wall, were of outstanding importance and a full and satisfactory explanation of them had not yet been found. Some of the effect was, no doubt, due to the fact that at such enormously high values of the current very great mechanical forces were developed between the neighbouring turns of the solenoid, so that a relative movement of the neighbouring turns was produced; the tendency was for the turns to pile up to the central part of the solenoid winding and if that movement was not checked, it very soon resulted in the rupture of the coil. Some very striking examples of the immensely powerful mechanical forces thus developed had been experienced during the course of the tests. For example, it was attempted to prevent the movement of the turns of the solenoid towards the middle region by means of a sheath of lignum vitæ, having a radial thickness of ¾ in.; the first discharge current, however, resulted in the complete shattering of that sheath. In another instance, a thick vulcanite sheath was fitted over the coil; the first discharge of the condenser, however, burst the sheath and drove the fragments through the oil and shattered the glass containing vessel.

In order to cope with those enormous mechanical forces it was eventually decided to build a steel cradle sheath and, so far, this had effectually prevented the creeping of the turns towards the middle part of the coil. In the first tests with the steel cradle it was found that after about 50 successive condenser discharges the coil, though unable to increase its outside diameter, sheared sideways and blew out the ends of the bobbin and ruptured near the centre of the winding. In order to prevent a recurrence of that, the bobbin had been made of steel with a longitudinal slit and it was confidently expected that that would satisfactorily solve the problem of coping with the immense mechanical forces developed.

It was highly probable, continued Dr. Wall, that the relative movement of the neighbouring turns of the solenoid was

partly an elastic movement and, as such, would develop a back e.m.f. in the coil which would have the effect of changing the effective value of the static constants of the coil. For example, such an elastic movement was a well-known method of producing a condenser action; it appeared to him, however, that no explanation of that kind could possibly account for the fact that the actually obtained current value for the first discharge peak was so much greater than the value as calculated from the constants of the coil. In the particular case already referred to, the actual current was about twice as great as the calculated value. An adequate explanation would be found if some hitherto unrealised store of energy was being released, and Dr. Wall submitted that that was a possible explanation of the phenomenon recorded.

Another oscillogram was then shown, taken with a different solenoid in which there was no iron in the core, and the peak values obtained in that case were as follows:—first peak, 21,300 amperes; second peak, 23,100 amperes; third peak, 15,100 amperes, and fourth peak, 10,200 amperes. The curious feature here was that the second peak value was greater than the first; further, both of those values were much greater than those calculated from the known constants of the coil. Next, an oscillogram, taken when a solenoid wound on an iron core was used, was shown and its first peak value, *viz.*, 4,200 amperes, was in fair agreement with the value as calculated from the constants of the coil. This particular solenoid was wound with 21 turns per cm. length, and consequently the first peak value of the current denoted that a magnetic intensity of about 11,000 gausses was produced at the central part of the core.

As had previously been stated, an essential and an original feature of the work was that the specimen of material on which the effect of the very intense magnetic fields was being investigated was submitted to the influence of the field repeatedly, and the automatic switch used, which had mercury cup contacts, permitted repeated application being maintained indefinitely. In that way it was hoped that a marked disturbance of the electronic orbits would be eventually obtained, notwithstanding the fact that the artificially produced magnetic field was only a small percentage of the value of the magnetic intensity within the atom due to the electronic currents.

It was suggested that a simple analogy to the author's method was provided by the well-known case in which the mechanical structure of a material—steel, for example—was ruptured by the repeated applications of a relatively very small stress, a stress so small, in fact, that a single application of it produced no appreciable effect on the strength of the material. The author believed that to be an extremely close analogy and that the method of repeated application would provide the solution for the extremely difficult practical problem of producing magnetic fields of an intensity equal to those which were generated within the atom by the electronic currents.

A third characteristic feature of the work was the use of a magnetic material as the substance subjected to the intense magnetic fields. The purpose of that was to provide a means for showing any marked change in the structure of the substance after it had been subjected to the extreme magnetic fields. It would be clear that any change that might take place in the electronic orbits, said Dr. Wall, would become evident by a change in the magnetic properties of the material. Such a change of magnetic properties has actually been obtained in the case of a specimen of "Stalloy." After being subjected to the condenser discharge—the conditions being that the first peak value of the discharge current gave a magnetic intensity at the central part of the solenoid of 1,400,000 gausses, there being 48 such discharges—the magnetisation curve of the specimen (which was previously known) was consistently better throughout the range. That seemed to the author to be an extremely significant result and the repetition of the condenser discharges was to be continued, the coil having broken down after the 48 discharges mentioned owing to the tremendous mechanical forces developed.

Dr. Wall claimed that the results already obtained had been sufficiently encouraging to make it highly desirable to obtain magnetic fields of still greater intensity than the highest values yet reached. Arrangements had therefore been made, and were now in active progress, to so modify the apparatus that the intensity of the magnetic fields within the solenoid might be increased to something like 10,000,000 gausses. It was hoped that immediately after Christmas that very high intensity of magnetic field would be obtained, and it was then confidently expected that decisively convincing proof of the definite and marked disturbance of the electronic orbit would be obtained.

The Economic Situation of the Netherland East Indies.

MR. H. A. N. BLUETT, Commercial Agent, Batavia, Java, has furnished the Department of Overseas Trade with a report upon this subject up to July, 1924.*

In an introductory general review Mr. Bluett says that although it is anticipated that the current year will prove more prosperous than any since the slump of 1920-21, there are many factors which must be considered before it is safe to predict that a new era of prosperity may be expected. Two matters that still have a depressing effect upon trade are the necessity for economy in all Government and municipal undertakings, and the considerable amount of taxation still outstanding. The Government was formerly a very good customer: the outstanding taxation prevents expansion. It is expected that Government revenue and expenditure will be balanced in 1925; until this is effected no reduction of taxation can be hoped for. The 1924 Budget provided for, *inter alia*, harbour work at Scurabaya, Tandjong Priok, and Belawan (600,000 guilders†), the erection of a generating station at Bolkit Asam (100,000 guilders), the electrification of the salt factory at Krampon (440,000 guilders), and postal and telegraph improvements (1,600,000 guilders).

The Government intends to do away with the income, surplus profits, and extra profits taxes, and to substitute a single "limited company tax" of 10 per cent. on profits, with a surtax of 25 per cent. upon that tax in 1925. It is also proposed to impose a tonnage tax upon all goods exported and imported averaging about 0.4 guilder (8d.) per ton.

Import Trade.

During 1924 the import trade, which was very bad in 1923, has slightly improved. There is now a better demand for machinery owing to depletion of stocks. The demand for power station machinery is confined principally to the Preanger Regency, though installations of importance are being planned for districts of growing prominence in the Outer Islands. Demand is improving for small oil engines for the purpose of generating electricity for lighting estates, hotels, kinemas, &c. Very soon the Government will be again a customer for all engineering requirements owing to the improved financial position of the State, and in all respects the outlook for the machinery market is very promising.

The British Empire holds an important position in the import trade of the Netherland East Indies. The latest available figures, those for 1922, show that of a total value of 782,782,000 guilders the British Empire supplied goods valued at 302,647,000 guilders (Great Britain 101,883,000, Straits Settlements and Federated Malay States 113,441,000). Although, no doubt, this sum partly represents goods of non-British origin transhipped at British ports, it may be accepted that a very considerable proportion was of British origin. Holland's share of the imports was valued at 156,217,000 guilders.

Export Trade.

The total value of the goods exported during 1922 was 1,148,895,000 guilders, as compared with 1,195,909,000 guilders in 1921. Only 5.3 per cent. of this total went to the United Kingdom, although 19.4 per cent. was sent to Singapore for transhipment.

One of the principal items of export was rubber, a total of 103,456,000 kg. having been exported in 1922; this rose to 139,746,000 kg. in the following year. This is estimated to be about a third of the world's requirements. The United States was the largest purchaser (34,079 metric tons), while Great Britain took 5,734 tons. In the Netherland East Indies British-owned companies have restricted output, but their voluntary sacrifices expressed in terms of the volume of rubber withheld from the market have been nullified by the increased production and export of rubber grown by natives in small holdings, known in the trade as "native" rubber. A proposal to place a tax upon this rubber, for purely fiscal purposes was rejected by the People's Council in the Outer Possessions by a majority of one. The quality of native rubber is improving, and an efficient marketing organisation has been built up by Chinese.

Railway Electrification.

It was expected that the service on the new electric railway Meester Cornelis-Tandjong Priok would be inaugurated before the end of the year; the Oebroeg hydro-electric installation, which has harnessed the Tjitjatih river (where a maximum of 70,000 h.p. will be generated), is now nearly completed.

The erection of the masts for the high-pressure line from Oebroeg power station is being rapidly completed, the switchgear (70,000 V) will be delivered shortly by the Siemens-Schuckert Werke, and the transformers (7,200 V) by the firm "Heemaf," Holland.

Plans are being discussed for the electrification of the line Emmahaven-Sawah Loento, in the west coast of the Sumatra residency, on which line coal from the Ombilin mines is transported. There are stations on the west coast of Sumatra which can supply the current required.

Another big electrification scheme under consideration is that of the line Wonokromo-Bangil. The current will be

* Stationery Office. Price 2s. 6d. net.
† 12 guilders = £1.

supplied by the Kali Konto hydro-electric installation to be erected within a period of from three to four years. It has been proposed that this installation should be jointly run by the Government and an electric power company operating largely in the country.

Water Power in the Celebes.

The hydraulic power reserve of the Mamasa river is reputed to be the largest known in the Malay Archipelago, and plans were drawn up some two or three years ago by a syndicate for the construction of a hydro-electric station and for the establishment of a chemical industry in South Celebes near Polewali on the gulf of Mandhar; the main difficulty encountered in all such schemes, however, is that a very large capital is required for the harnessing of waterfalls and the generating of sufficient hydro-electric power for the manufacture of synthetic nitrates, and although Dutch and foreign financial markets have been canvassed for funds for the exploitation of the Garoega Falls, the necessary money has not yet been raised. At a recent meeting of the N.V. Stikstofsyndicaat, at which several prominent business men were present, it was decided to make another effort to collect the capital of 30 million guilders, estimated as necessary for developing the Mamasa concession, and it is now reported that support for this hydro-electric chemical manufacturing scheme may be forthcoming from the United Kingdom and the United States of America, and that an engineer will shortly report fully on its possibilities for profitable exploitation.

Notes on the Market.

Mr. Bluett gives a great deal of information regarding the sale of goods in the Netherland East Indies. He says that competition is extremely keen; local engineering firms hold representations for the best-known manufacturers of machinery in Great Britain, Holland, Germany, the United States, Switzerland, France, and Sweden, and are prepared to cut their profits to an absolute minimum in order to obtain the orders that are expected. Firms not already represented will experience difficulty in finding agents, as the number of local importers of machinery and engineering equipment is limited, and one and all have old-established connections. British and Australian manufacturers have recently been successful in placing agencies, and British representation has appreciably increased during the last 12 months. It is most difficult to introduce an unfamiliar article to this market; cases have come to Mr. Bluett's notice in which principals have cancelled agency agreements within 12 months on account of the disappointing results obtained. This is hardly fair to the local agent who may have done a great deal of preliminary work and fostered general interest in his principals' goods without being able to effect sales owing to existing stocks.

During the period under review imports from Great Britain have improved; Germany is now not so active a competitor, and British offers are in price more in conformity with Continental offers while retaining the original quality of the goods.

"Phonofilms" or Talking Motion Pictures.

Dr. Lee De Forest's New Process.*

By C. F. ELWELL, B.A., M.I.E.E.

(*Abstract of paper read before the* ROYAL SOCIETY OF ARTS.)

MANY inventors have tried to solve the problem of making perfectly synchronised talking motion pictures. "Wireless" has made the perfectly synchronised talking motion picture possible upon sound scientific and commercial lines. It is my intention to explain how the three-electrode valve has made possible talking motion pictures, which will be shown to you, and you will note the perfect sychronisation of the words of the speakers with the motion of their lips, as well as the faithfulness of reproduction of the voices, music, and of song.

Dr. De Forest laid down as a first essential to the commercial success of "phonofilms" that only standard film as used in the kinema should be employed. On a narrow strip, only 3/32 in. wide, he has succeeded in recording all kinds of sounds; the balance of the width of the film, which is 1 in. in width, is used for the picture in the ordinary way. The very narrow sound record, which will be magnified until it is about 12 in. in width on the screen, is marked with a varying number of light and dark horizontal lines of different widths; if a high-pitched note is being played you will note the large number of fine lines, indicating a high frequency; if a low-pitched note is being played or sung, the horizontal lines become thicker and there are fewer of them, indicating a low frequency.

The picture is taken in the ordinary way by means of the ordinary kinema camera. In the camera a small gasfilled lamp is placed; the sounds emitted by the speaker are picked up by means of a very sensitive microphone, the very small electric currents from which are amplified enormously by means of a three-electrode valve amplifier, in order that the variations of the electric currents which represent the sounds made before the microphone shall be large enough to affect the light emitted by the lamp in the camera. The light from the gasfilled lamp passes through a very fine slit placed as close as possible to the celluloid film, and the variations of the intensity of the light from the lamp are recorded photographically on the film in the form of horizontal lines. The picture and sound have thus been recorded simultaneously and upon the same film; synchronisation must therefore be perfect. The film is then developed and is known as the negative, from which any number of positive prints can be made.

The *reproduction* of the photographically recorded sounds is also very simple. The roll of positive film is placed in an ordinary kinema projector, to which has been fitted an attachment containing a small incandescent lamp, a fine slit which is only 0.0015 in. wide and 3/32 in. long, a guide for the film, and a photo-electric cell. The light from the small incandescent lamp shines through the fine slit; the film is guided so that the portion upon which the sound is recorded passes before this illuminated slit. The intensity of the light which passes through the more or less translucent film is governed by the number and width of the horizontal lines, and the fluctuating beam falls upon the photo-electric cell. A photo-electric cell changes its resistance with the intensity of the light falling upon it; for talking motion picture work it is essential that these changes should be instantaneous. The Thalofide photo-electric cell, invented by Mr. T. W. Case, is in effect practically instantaneous in its action, and the fluctuating beam of light is thus transformed into small electric currents which, by means of a three-electrode valve, are increased in strength, until they are strong enough to operate a loud speaker, which is perhaps the weakest link in the chain.

Because of the invention of the "phonofilm" an entirely new form of screen drama can now be worked out, taking advantage of the possibilities of introducing music and voice and appropriate acoustic effects, not necessarily throughout the entire action, but here and there where the result can be made most effective. It is incumbent upon scenario writers to see the possibilities and to work up their situations and scenes around such acoustic effects as can be successfully brought out.

Discussion.

The CHAIRMAN, Mr. A. A. Campbell Swinton, congratulated Mr. Elwell upon the success of his demonstration, which was the first that had been made in this country.

Mr. ROBERT W. PAUL said he had learnt a good deal by watching the process illustrated on the screen. When one considered the present position of the moving picture in public estimation, and the possibilities that arose out of the invention which had been shown, one could set no limit to its development.

Sir RICHARD PAGET, Bart., said that undoubtedly the loud speaker was the weakest link in the chain; but he had no doubt that even with the means at present available, as for example the pleated disk type of loud speaker, more perfect reproduction could be got. The general synchronisation was extraordinarily good, and seemed hardly capable of being improved.

Mr. LLEWELYN B. ATKINSON and Mr. C. H. FRIESE-GREENE also spoke.

Mr. CHARLES R. DARLING said he had looked very carefully to see whether the motions exactly synchronised with the sound, and he had been unable to detect any difference whatever. The method seemed to him to be excellent. He thought he could predict a time when scientific lectures might be shown in that way, and the very best lecturers might be made to give their lectures to audiences all over the world. There appeared to be a very great future indeed for the process.

Major BASIL BINYON, O.B.E., said that one thing had struck him, *viz.*, the really very wonderful and extraordinary degree of low-frequency amplification which Mr. Elwell had been able to carry out from those extremely feeble currents which he got from his photo-electric cells. A large number of stages of low-frequency magnification produced a great many technical difficulties, and the inventors had to be very warmly congratulated upon being able to produce such a large volume

* From the *Journal* of the Society.—*Abstract.*

of sound from such exceedingly small currents. Mr. Elwell had referred to the fact that if the film was broken accidentally the synchronisation would not be disturbed, as it was possible to join the film again; he wondered whether cutting out a small portion of the film would make any difference.

Mr. C. F. ELWELL, in reply, said that so far as he knew no pieces had been cut out of the films, but in his experience a small portion of film missing was very hard to detect. Those who were developing the method must crawl before they could walk. He had the equipment in England necessary to make pictures, and hoped to be making next year real all-British pictures.

West Midland Electricity District.

Electricity Commissioners' Inquiry.

THE Electricity Commissioners sat at Wolverhampton, on December 16th, to consider amendments to the draft order constituting the West Midland Electricity District, and incorporating a Joint Authority. The questions raised included the opposition by the Conference of Local Authorities promoting the scheme to the suggestion that workers be represented on the West Midland Authority; opposition by the same authority to the "nuisance clause" in the draft order being retained; while there was an interesting suggestion that the duplicate cable for Cannock should be laid through Shifnal.

The Commissioners present were Sir Hy. Haward (vice-chairman), who presided, and Mr. W. Lackie, with Mr. E. N. Hudson (legal adviser), and Mr. D. S. Cumberledge (clerk).

Concerning the workers' representation, a letter from the Electricity Supply Commercial Users' Association was mentioned deploring the fact that no provision had been made in the draft order for the representation of workers. The communication pointed out that representation had been given on the Joint Electricity Authority for London and asked that two workers should be appointed to the West Midlands Authority.

Mr. MONTGOMERY, K.C. (for the Conference of Local Authorities) said the Conference was undoubtedly opposed to this suggestion. It felt it was not quite a *bona-fide* desire on the part of the workers, and there was very great difficulty in managing representatives of that kind. He thought that if the representatives were wise they might help in carrying out the organisation, but it was far more likely that it would lead to friction and diverse views. His instructions were to offer strenuous opposition.

THE CHAIRMAN (Sir Harry Haward) remarked that the Commissioners were placed in a somewhat difficult position inasmuch as it was generally contemplated that workers should have representation. Parliament must be held to have laid down that, where suitable, there should be workers on such bodies. This was only the second Joint Electricity Authority that it was proposed to set up and London had made a request for such representation.

Mr. MONTGOMERY said that if the Commissioners felt there should be such representation he asked that the representatives should be chosen by the vote of the employés of the authorised undertakers concerned.

THE CHAIRMAN said the Commissioners felt the matter was of very considerable interest to public policy, and if, after weighing up all that had been said, they felt there should be representation, they would bear in mind Mr. Montgomery's proposal.

MR. MONTGOMERY mentioned the "nuisance clause," which he said was so desperately important that it should not stand. It was Clause 81, and unless it was excluded, he said, it would be possible on the ground of committing a nuisance to hold up the whole scheme.

MR. MORSE (Shropshire Power Co.) intimated that it was a general provision which applied to his company as well.

MR. MONTGOMERY suggested that at least the scheme for building a station at Ironbridge should be protected specifically against the nuisance clause.

The CHAIRMAN pointed out that the matter would arise when they came to deal with the Ironbridge station.

MR. MONTGOMERY: The undertakers could have got protection if they had gone before Parliament, but apparently they are to lose it by coming before the Commissioners.

The CHAIRMAN: We do not say you shall not have protection, but it is a question of the form in which you shall have it.

MR. MONTGOMERY said he was content to leave the matter at that.

Regarding the especial needs of an agricultural district, the CHAIRMAN called attention to a letter received from the Shifnal Rural District Council, in which it pointed out that Cannock was going to be supplied by a cable from Wolverhampton. It had also asked for a duplicate cable and the letter included the suggestion that this should be laid through Shifnal.

MR. REVEL PHILLIPS, clerk to the Shifnal Rural District Council, pointed out that while his Council did not propose to make a claim, it was of the opinion that unless the Commissioners gave some assistance it was likely to remain in the same position as it had been in for the last twenty years under the authority of the Shropshire Power Co. The company had never done, and was never likely to do, anything. Agricultural areas, such as the Shifnal rural district, were languishing for want of assistance, and he felt very strongly that the whole district would benefit by such a cable.

The CHAIRMAN intimated that he would consider it and would like to hear counsel on the point later on.

MR. TURNER, on behalf of the urban and rural authorities, said that rapid developments were taking place westward of Cannock, and it was thought that if a second cable was laid to Cannock it should be laid through Shifnal.

MR. MONTGOMERY said the undertakers objected to that entirely on the ground that they did not wish to be saddled with the obligation of laying a line through a barren district.

MR. TURNER said that it was not to be an additional line. A line in triplicate was to be laid from Ironbridge to Wolverhampton, and all that was suggested was that one of those lines should take the course suggested.

MR. MONTGOMERY said his clients were ready to meet any loads as they arose, but they did not want to be bound down.

MR. TURNER, on this point, referred to the fact that at the previous inquiry the undertakers' expert witness, Mr. Rider had himself anticipated a heavy load west of Cannock.

Consideration was given to the wording of the preamble. Mr. Montgomery suggested that instead of the words "certain undertakers have agreed to transfer their generating stations, &c.," it should be "intend to transfer, &c." Mr. Turner pointed out that it was an important modification, but the Chairman said he thought "intend" would be sufficient in the preamble. The inquiry then concluded.

Three-Position Railway Signalling.

I.R.S.E. Committee's Report.

THE Committee appointed in March, 1922, by the Institution of Railway Signal Engineers to report on three-position signalling has completed its work, and its report was submitted by the president to a meeting of the Institution on December 10th. It outlines the broad principles of the future application of 3-aspect signalling.

So far as this country is concerned, installations of three-position signalling are few and far between, but a questionnaire (Appendix I) was sent to those signal engineers in this country and the Colonies who had such installations under their control, and the Committee has studied in detail the principles of the systems in the United States, the Colonies, and Belgium. Data on the cost of stopping and re-starting various classes of trains are also given by Mr. E. C. Irving, of the British Power Railway Signal Co., in Appendix II.

In view of the introduction of daylight colour light signals, the term "three-position signalling" is considered a misnomer, and the term "three-aspect signalling" has been adopted throughout the report. The greatest difficulty of the Committee was to find a suitable definition for the cautionary or middle aspect. Where there is full braking distance between successive signals, the interpretation of the three aspects given will be as follows:—*Red light*—Stop. *Yellow light*—Caution, be prepared to stop at next signal. *Green light*—Proceed, all right. The fundamental principles must be based on space and speed, instead of as at present on space only, and a single three-aspect unit is not sufficient to meet all conditions likely to arise for the reason that a driver passing a three-aspect signal at "proceed" knows that the next signal ahead is "off" but *does not know* whether it is at "caution" or "proceed," and where such signal ahead is less than braking distance from the next stop signal, it is essential that a driver should be given this information.

It is recommended that with the adoption of three-aspect signalling in this country there shall be introduced a fourth signalling aspect, which will be defined as: .Attention—run at medium speed.

Such an aspect will have a marked effect in speeding up operation in congested areas, which would be its chief point of application, and also it would be of great value in overcoming the present difficulty in dealing with the distant signal on approach to termini and on severe curves where the distant signal is often fixed permanently at "danger," thereby nullifying its usefulness in traffic operation. For general running conditions, four aspects will be found sufficient except in highly congested areas where certain "closing up" or "draw ahead" signals may be required, *e.g.*, leading to a station; the colour or combination of colours needs very careful consideration. The Committee recommends the use of double yellow.

For British practice three-aspect signalling should be confined to the colour light type of signal for the following reasons:—Fewer aspects are required for similar indications; although there is little difference in installation costs, light signals are much more economical to maintain. Owing to smaller space required, much less difficulty is encountered in locating light signals than semaphores, and light signals are considerably more effective in foggy weather. Drivers would know immediately on sighting the signals that they were

three-aspect signals, which at night would remove any possibility of mistaking two-position signal indications for three-aspect indications. It will permit of the employment of the two-position upper quadrant signal (0 deg.—45 deg.) as the standard semaphore signal, both for manual and for power working, and will also obviate the suggestion that two-position signals shall always operate in the lower quadrant to distinguish them from three-position semaphores.

The restriction of semaphores to two-aspect signalling will not be an expensive matter, as there are very few installations in this country. It is recommended as better practice to dispense with colour lights in the case of ground shunt signals, utilising illuminated "position" signals in lieu of them.

A line carrying a mixed traffic can only be worked to its maximum capacity by the adoption of such a system. It does not appear that, beyond the general comments above, any additional advantage would accrue to goods train operation by the introduction of three-aspect signalling, nor should it entail any disadvantages.

With regard to electric passenger trains, in those cases in this country with which the Committee is familiar, the distance between signals is relatively great, taking into account the greatly superior accelerative and decelerative capabilities of electrically-operated stock, and the conditions may be regarded as analogous to signals spaced one mile or more apart on steam roads, with the result that with the three-aspect type the cautionary aspect would be encountered sooner than was necessary, with consequent delay. The distances between signals on electric lines are based on the required headway, and are generally in excess of the distance required for braking, and to avoid giving a caution signal until necessary, repeaters are provided. Unless the service requires to be so intensive that the distance between "stop" signals is only equal to the braking distance, three-aspect signals would be a hindrance to the operation of such a line.

It is therefore recommended that in such cases and where colour light signals are employed, the signal immediately to the rear of a repeater shall be a two-aspect signal, showing red and green, repeater signals shall show yellow or green, and other signals shall show the aspects given in the report.

A minority report is signed by Mr. S. L. Glenn (British Power Railway Signal Co.), who is in full sympathy with the major portion of the majority report, but does not agree with the decision regarding the type of signal to be employed, *i.e.*, he thinks it a mistake to confine three-aspect signalling to colour light signals.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

The "Don" Quick-make-and-break Tumbler Switch.

In our issue of June 6th last (p. 945) we described the "Buck" switch, invented by MESSRS. A. P. WITCHELL AND A. SHORE. This switch has now been improved in several respects, and, under the name "Don," is in effect a new design. As before, the switch consists of a pivoted blade mounted in a porcelain base, which engages at its ends with

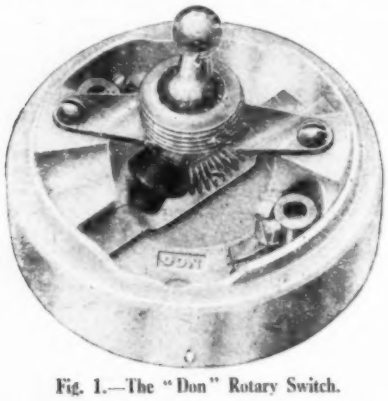


Fig. 1.—The "Don" Rotary Switch.

fixed contacts. On one edge of the blade a trackway is now formed, and a roller, mounted underneath the dolly and urged under spring pressure, engages with this trackway, forcing the switch blade over at each movement of the dolly. The action is instantaneous as the spring is compressed right up to the centre point of the blade, and when it reaches this

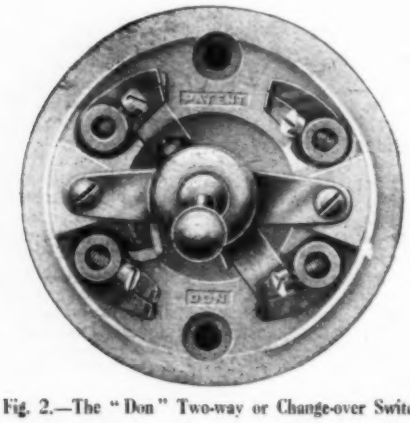


Fig. 2.—The "Don" Two-way or Change-over Switch.

point (or a fraction of a second before) the spring is released and snaps the contacts "home." The action is entirely independent of the speed of operation, and if the movement is not completed the dolly returns to its original position.

Fig. 1 shows the device applied to a plain tumbler switch, while fig. 2 illustrates its application as a two-way or change-over switch. These switches are being sold by the DON ELECTRICAL CO., Endwell Works, Brockley, S.E.4.

The "Kook-Rite" Oven.

The cooking equipment illustrated in fig. 3 possesses a novel arrangement whereby a top grill is made reversible so that it can, at will, be made to supply heat to the oven. Conversely, when the grill is being used, the oven element can be switched on to augment the heat from the grill element. The grill loading is 250 W, and that of the

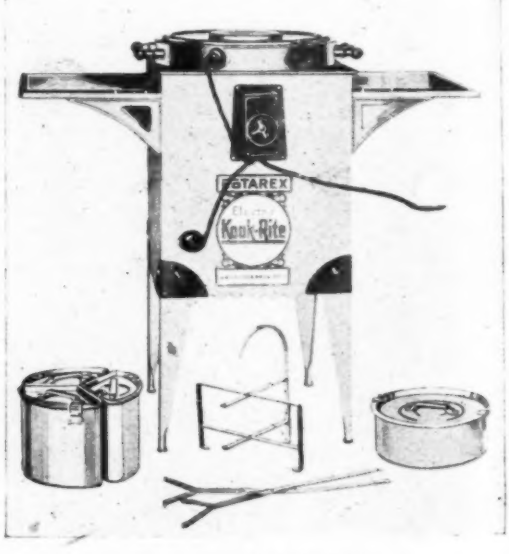


Fig. 3.—The "Kook-Rite" Oven.

oven 410 W, and the connecting plugs are arranged to enable either or both elements to be used. The oven is heavily lagged, and is equipped with a "timeter" which can be set to switch off the current at any required time.

The equipment includes four aluminium utensils, a baking rack, and a set of lifters.

The sellers of this equipment, which is known as the "Rotarex Kook-Rite," are MESSRS. DUNCAN WATSON & CO., 61-62, Berners Street, W.1.

The "Rawlplug" Bolt Anchor.

The latest development of the widely-used "Rawlplug" is designed to accommodate larger screws than heretofore. This is a "bolt anchor" (fig. 4) which permits the obtaining of very strong fixing in any hard material, as rock, brick, or concrete. The anchor is an all-metal plug consisting of a truncated cone of chilled iron attached to a lead cylinder. The iron cone is divided into segments which are shaped in such a

way that the edges are sharp at their greatest diameter. A hole is prepared in the material in which the bolt is to be fixed by means of a "Rawlplug" boring tool. The bolt is then placed head first in the hole and a washer is slipped over it to rest in front of the head. The anchor is then placed over the bolt with the cone-shaped head foremost. The cone is then caulked by means of a special caulking tool.

Fig. 4.—The "Rawlplug" Bolt Anchor.

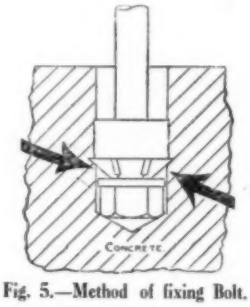


Fig. 5.—Method of fixing Bolt.

The lead is by this means wedged firmly against the bolt and the walls of the hole, and the hard iron cone fractures at the segments, forcing the cutting edges into the surrounding material (see fig. 5). The more the bolt is stressed the more these segments become embedded in the wall. The "Rawlplug" bolt anchor is made for use with bolts of from ⅜ in. to 1¼ in. diameter. The lead cylinder in the larger sizes is in two parts to facilitate caulking. The makers, the RAWLPLUG CO., LTD., Gloucester House, Cromwell Road, S.W.7, state that an anchored ⅜-in. bolt broke at a pull of 7 tons.

A New "White" Multi-way Joint Box.

In order to meet conditions where a large number of cables have to be dealt with in one joint-box, Mr. J. C. WHITE, of 49, Bridge Street, Manchester, has introduced a new multi-way joint-box which embodies a number of improvements. The box, illustrated in fig. 6, and the cover are pressed out of heavy-gauge tinned brass; the former is provided with four gates, each capable of accommodating three twin 0.029 leads under gate covers which can be completely removed without removing the screws, so that the cables can be laid flat in position without threading; the gate covers provide for bonding lead-sheathed cable, and the screws are long enough to take a 7/0.036 cable. The "White" blind connectors are

Fig. 6.—J. C. White Multi-Way Joint Box.

used, so that the ends of the leads cannot make contact with the cover, and these provide ample space for eight single points; three patterns are shown in the figure—single, double, and two-way. The connectors being disposed at the edges of the base leave the whole of the interior free for the cables, which can be arranged with slack and easy bends, wiring being very simple. The base is corrugated, and stands clear of the wall, so that moisture running down the wall passes behind the box; this provides also for varying thickness of cable, as the cover passes over the base with a fair amount of overlap. The box is fixed by a single screw, which is separated from the cables inside by a tube, and the metal opposite the gates is slit, so that with a pair of pliers a suitable opening for the cables can easily be made.

This joint-box is specially suitable for countries where small fans are used together with lighting appliances, involving a multiplicity of switch points; it also serves in this country in cases where two ordinary joint-boxes would have to be fixed side by side. It supplements but does not supersede the ordinary White joint-box.

Reviews.

Industrial Electricity, Part I. By CHESTER L. DAWES, S.B., Assistant Professor of Electrical Engineering in the Harvard Engineering School. Pp. xiv+371. Figs. 311. London: The McGraw-Hill Book Co., Inc. Price 11s. 3d.

This is an elementary book, essentially of a descriptive character, written to meet the demand which has arisen in America due to the establishment of elementary electrical engineering courses in many technical high schools.

The present volume deals solely with general electrical principles and with their direct current applications. It is to be presumed that alternating current applications will be dealt with on similar lines in a second volume, thus keeping to the plan usually adopted by writers of separating the work on the two types of current. There is a good deal to be said for a less marked division of the work, and in this country there is a tendency becoming noticeable in certain directions to intermingle the two branches to a greater extent than has been done in the past. Thus, to give an example, there is the case of armature reaction where we have the fundamental phenomena very similar in both direct current and alternating current generators, though there are, of course, differences in detail due to the different modes in which current varies with time in the armature conductors in the two cases. The author perhaps realises the advantage of this tendency as regards economy of matter since in the preface he states that direct-current power transmission will be dealt with in Part II along with alternating-current power transmission on account of their close relationship.

Generally speaking, the book contains sufficient matter (though there is a noteworthy omission of any work dealing with lamps and illumination) in connection with direct current work to bring students up to the standard of the Senior National Certificate and the text is accurately and clearly written. It is particularly pleasing to see so much attention paid to Kirchhoff's Laws and their applications, a subject to which a very insufficient amount of space is commonly allotted. There is little call for criticism, but on page 63 we see that the bald statement is made that one horse power is equivalent to 746 watts; this is perhaps all that could be done with the sequence and definitions of units adopted in the work, but had a somewhat different treatment been used it would have been possible to derive the number 746 by making use of earlier definitions and well known numerical relationships between English and C.G.S. units of the more fundamental quantities and such a derivation is valuable and very instructive.

The diagrams are clearly drawn and the only ones meriting adverse comment are those numbered 37 and 38, where the magnetic lines have been drawn with insufficient care. A large number of classified examples are given at the end of the book, and their value would be greater if answers were included to those involving numerical work. In conclusion, we would say that the book strikes us as being especially suitable for recommendation to men who have taken up some other branch of engineering as their main subject and who wish to obtain an accurate knowledge of the elements of direct current electrical engineering without going too deeply into the subject.

The Electrical Design of Overhead Power Transmission Lines. By W. T. TAYLOR and R. E. NEALE. Pp. vii+266; figs. 25 plates and 48 tables. London: Chapman & Hall, Ltd. Price 21s. net.

This book contains all the information required for the electrical design of overhead transmission lines, with the exception of some of the more complicated problems associated with the design of lines for pressures exceeding 60,000 volts.

Chapter 1 deals with circuit relations in various systems, and the effects of resistance, inductance, and capacity are clearly illustrated by means of simple formulæ and vector diagrams.

Chapter 2 discusses the respective merits of various conductor materials, including copper, aluminium and steel, either solid or stranded. The advantages to be obtained by the use of steel cores with copper or aluminium conductors are also mentioned. Formulæ for weights, cross sectional areas, resistances, and numbers of individual wires in stranded conductors are given. In connection with the last item there is, however, a curious mistake. On page 54 the authors state that "Actually, six circles touching a central circle of equal diameter do not touch each other, because the circumference of the circle on which the centres of the six circles lie is 2π (or about 6.28) times the diameter of each of these circles. At every third or fourth layer it is theoretically possible to get an extra wire into the layer . . ." The initial statement in this extract is evidently incorrect, although the conclusion drawn from it is quite right. If "d" is the diameter of each circle then the number of circles which can be arranged round a circle of diameter "nd" is $\pi/\sin^{-1} 1/(n+1)$, and in the case where "n" is unity the number is therefore six exactly.

Chapter 3 briefly indicates the methods to be adopted to obtain a minimum annual cost, by balancing the cost of power losses against annual charges.

Chapter 4 deals with power factor, and such problems as the effects of low power factor on losses, generator capacity, and regulation are dealt with in a clear and interesting manner.

Methods of improving power factor, together with explanations of the calculations involved, are also included.

Chapter 5 is devoted to a discussion on the various alternative bases for the design of lines. The selection of a suitable line pressure, according to the distance of transmission, is dealt with, and the effects of power to be transmitted, power factor, load factor, line pressure, frequency, temperature, conductor material, regulation and losses upon the design, are all fully considered.

Chapter 6 deals with calculations of power losses and impedance. A number of formulæ are given together with examples illustrating their use. This chapter also contains many charts, by means of which the various problems may be solved graphically. The remaining chapters are devoted to calculations of weights and costs, designing for minimum cost, and comparison of various transmission systems.

This book should be of great value to those engaged in the actual design of transmission lines, while at the same time it contains much information of general interest, especially to students. It is well produced and is set out in an attractive manner. Such a book, of necessity, contains a great deal of data in the form of figures, and this is excellently presented in tabular form. A further advantage is that the engineer who uses the book has the choice, in nearly all the calculations, between formulæ and graphical solutions.

Captain Eckersley Explains. By P. P. ECKERSLEY. Pp. 86; 30 illustrations. London: The Wireless Press, Ltd. Price 2s. net.

This little book is intended to help the listener to clear up his own technical difficulties as well as to appreciate those of the British Broadcasting Company, and there could be no author better qualified for the work.

Without being technical, Captain Eckersley gives the best technical advice, based on common sense and unique experience. He sweeps aside all the talk of "wonderful work" done by amateurs, though fully recognising its great educative value. He rightly lashes the transmitting amateur who insists on using a radiating aerial when he should be using an artificial one, both for his own sake and for the sake of others. He explains why spark interference is a necessary evil, but also how it can be minimised by the use of reasonably selective receivers. He reiterates continually the advantages of using a receiver which gives really strong signals.

In fact, he says everything that a professional radio engineer would like to say to a listener, and he says it so well and so tactfully that none will read it without pleasure as well as profit.

We are glad to see his generous and well deserved tribute to "the one man in Britain who has done so much magnificent work" and whose name, he says, "I may not reveal," but really Captain Round cannot hope to remain concealed under such a thin disguise.

It is a book which we sincerely hope will have a large circulation amongst those for whom it was written.

A few ugly sentences such as "It may not be him" on page 51 will be straightened out no doubt in the next edition.

Chemistry and Atomic Structure. By J. D. MAIN SMITH, Ph.D. (Birmingham), B.Sc. (Lond.). Pp. 221. 20 Diagrams. London: Ernest Benn, Ltd. Price 12s. 6d. net.

During the last thirty years, rapid strides have been made in the realms of physical science, and considerable progress has taken place relating to the nature of atomic structure. The volume under review is an able exposition of the present position of knowledge of the atom, and gives a general idea of the development of the theories of atomic matter and sub-atomic chemistry from earliest times down to the present day. The majority of scientific students are unable to afford the time to study original papers or to work through the mathematics involved, but are desirous of being acquainted with the modern development of physical science, and to gather at least a general idea of the channels by which it has proved possible to study thorium and radium emanation, radio-activity and electron structure. The volume on "Chemistry and Atomic Structure" is singularly well adapted to this end.

The volume is fittingly dedicated to the memory of Werner, the founder of the co-ordination theory of atomic valency and molecular constitution. It furnishes a concise and logical exposition of Werner's original hypotheses, and brings these conceptions into line with recent experimental evidence and modern philosophic thought.

Dr. Main Smith devotes his opening chapters to the fundamental topics of atoms, molecules, valency, electrochemistry and the classification of the elements, dealing with ancient theories of atomic matter, chemical theories of the atom after the Renaissance, a discussion of Dalton's Atomic Theory, various nucleus, polybasic and polyatomicity theories, together with Arrhenius's theory of Electrolytes and Van't Hoff's theory of Osmotic Pressure. Later in the treatise the author proceeds to deal with radioactivity, atomic physics, atomic structure, and the "relativity effect" on mass. It is extremely refreshing to find a chapter on "Atomic Physics" in a treatise of this nature. Hitherto there has been a marked tendency for writers on chemical subjects to ignore the purely physical aspects of borderland problems. How many chemists were satisfied with the conceptions of atomic and molecular structure put forward by Lewis and Langmuir in spite of overwhelming objections from the physicist?

The chapter on "Radio-activity and Sub-Atomic Chemistry" is extremely well written, and is perhaps the outstanding feature of the volume. Rutherford's Discovery of Thorium Emanation is discussed, Dorn's Discovery of Radium Emanation, and also the Electron Structure of Radioactive Atoms. It will be remembered that it was originally assumed that the atoms were constituted by shells of electrons embedded in a comparatively large sphere of positive electricity. It was Rutherford who showed that this theory could not be reconciled with his experiments on the scattering of alpha rays, and proved that the positive nucleus must be very small in comparison with the dimensions of the atom.

The book is most comprehensive in its treatment of a difficult and rapidly developing subject. A much appreciated feature of this book is its treatment of fundamental ideas, before proceeding with the more modern and complex conceptions of atomic structure.

The relative proportions have been well allotted to these different sections. The critical outlook of the author throughout the volume will certainly appeal to all scientific students and stimulate much original thought. Dr. Main Smith has not hesitated to put forward speculative views of various problems, theories of molecular structure are critically reviewed and the quantum and relativity theories are given in a highly explicit manner.

Throughout the whole volume the author's theme has been developed in a consecutive and orderly fashion, and indicates lines of research which may be profitably followed, and the treatise may well form an encouragement and a stimulant to those who would push investigation further.

The book is accompanied by a bibliography of the more important works and original papers in English, published in recent years, on atomic structure, chemical co-ordination and valency direction.

The author deserves the warm gratitude of all students for the valuable service he has rendered to science, and is to be cordially congratulated upon the results of his labours.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

21,415. "Electric condensers." A. Freen. August 23rd, 1923. (225,267.)

21,475. "Wire-drawing machines." Western Electric Co., Ltd. (Western Electric Co. Inc.). August 24th, 1923. (225,270.)

21,503. "Method of and means for electrically heating a room or building." R. Grierson and Grierson, Ltd. August 24th, 1923. (225,272.)

21,600. "Earthing switches for use with wireless circuits." J. E. Hough, Ltd., and F. W. Pleasance. August 27th, 1923. (225,276.)

21,653. "Variable-inductance devices, and the adjustment of the same." Igranic Electric Co., Ltd., A. H. Curtis, and G. Dandridge. August 27th, 1923. (Cognate application 26,717/23.) (225,279.)

21,746. "Electrical relays." R. N. Conwell. August 28th, 1923. (225,283.)

21,798. "Connection of electrical apparatus or instruments in electric circuits." W. H. Matthews. August 29th, 1923. (Cognate application 28,021/23.) (225,287.)

21,903. "Thermionic vacuum tubes or valves." C. Seymour and H. G. Hughes. August 30th, 1923. (225,293.)

22,206. "Sound-amplifying horns." Fuller's United Electric Works, Ltd., and A. P. Welch. September 4th, 1923. (225,301.)

22,893. "Electric condensers and resistances for use in wireless circuits." W. S. Worthington. September 12th, 1923. (225,313.)

23,085. "Arrangement for controlling an electric motor." English Electric Co., Ltd., and T. Zweigbergk. September 14th, 1923. (225,315.)

23,876. "Contacts or terminals for electrical switches." Midland Electric Manufacturing Co., Ltd., and W. L. Barber. September 25th, 1923. (225,319.)

25,716. "Galvanic batteries." Oldham & Son, Ltd., and W. D. Wilde. October 15th, 1923. (225,334.)

31,345. "Sparking plugs." J. A. M. Soc. Anon. des Etablissements Industriels. December 16th, 1922. (208,546.)

32,104. "Electric clocks." F. Holden. December 21st, 1923. (225,401.)

32,521. "Electrical accumulators." L. A. Lammerts. April 24th, 1923. (214,948.)

1924.

463. "Bipolar agglomerate for electric cells." G. Weissman. January 7th, 1924. (225,407.)

4,575. "Electrical detectors or testing devices." F. M. Denton. February 22nd, 1924. (225,428.)

5,176. "Small single-phase motor with short-circuited armature." Landis and Gyr Akt. Ges. March 1st, 1923. (212,263.)

6,860. "Control of change-speed gear for use with electric motors." Traction Electrique Rationelle. November 19th, 1923. (225,164.)

7,722. "Manufacture of electric cables." B. Kolanczyk. July 11th, 1923. (218,975.)

10,051. "Tramway trolley poles." M. Henderson. January 15th, 1924. (225,455.)

10,456. "Electric arc furnaces." Soc. d'Etudes et de Constructions Metallurgiques. December 17th, 1923. (225,458.)

14,454. "Electric push-button switches." J. F. Monnot. June 14th, 1924. (225,472.)

18,884. "Devices for attachment of electrical conductors to insulators." F. H. Krebs. August 8th, 1923. (220,326.)

24,566. "Electrically-controlled signalling apparatus." J. H. Thompson. August 27th, 1923. (Divided application 224,632.) (225,493.)

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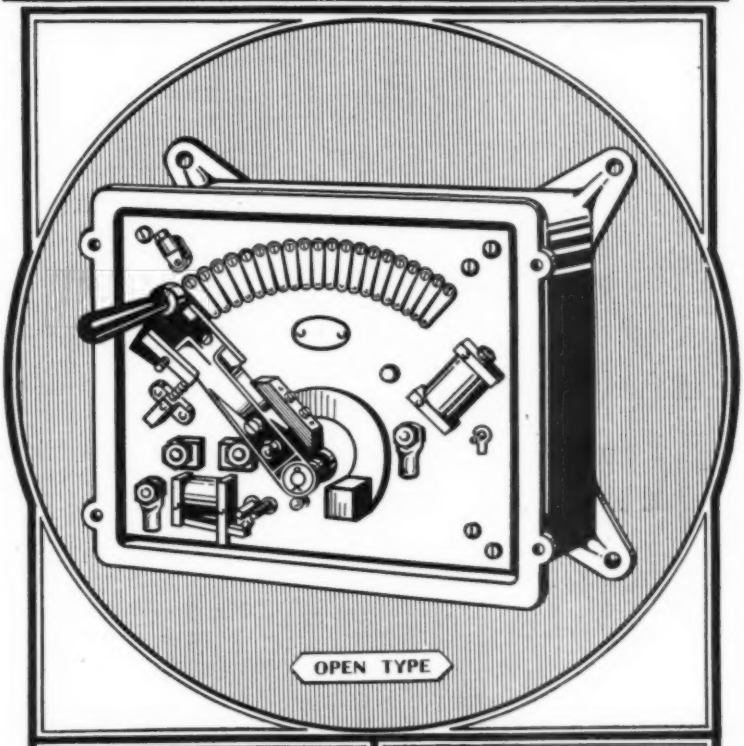
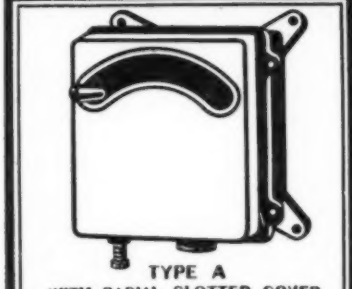
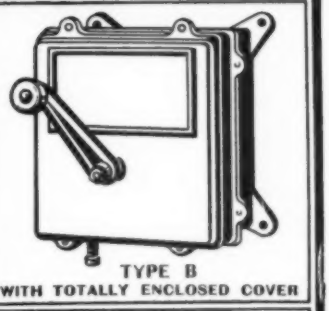


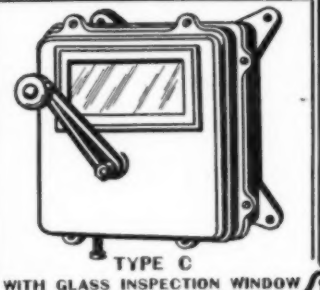
OPEN TYPE



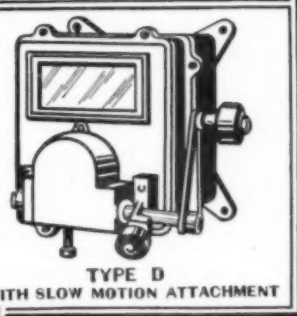
TYPE A
WITH RADIAL SLOTTED COVER



TYPE B
WITH TOTALLY ENCLOSED COVER



TYPE C
WITH GLASS INSPECTION WINDOW



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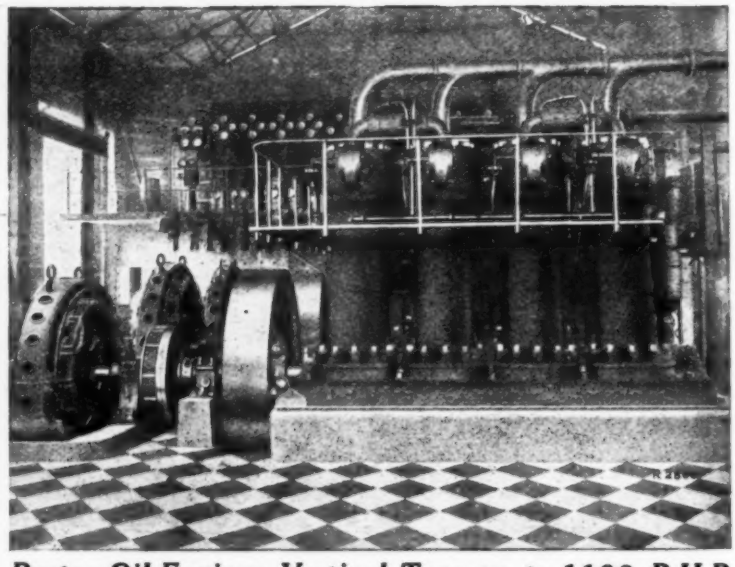

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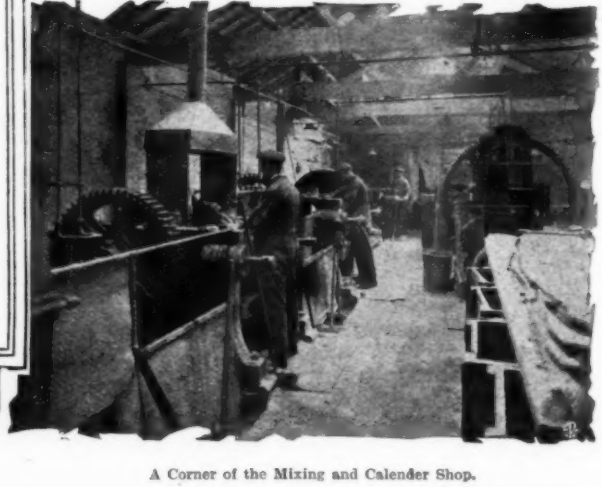

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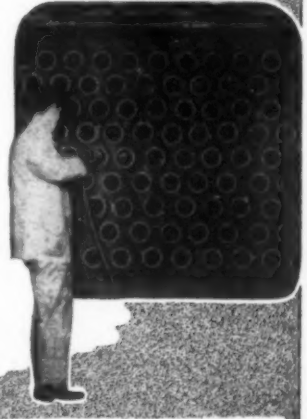

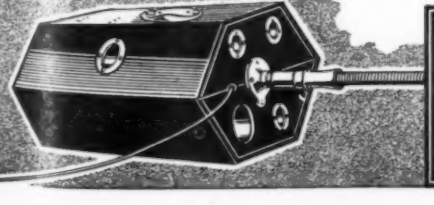

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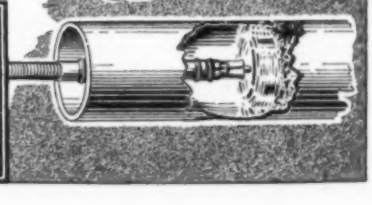

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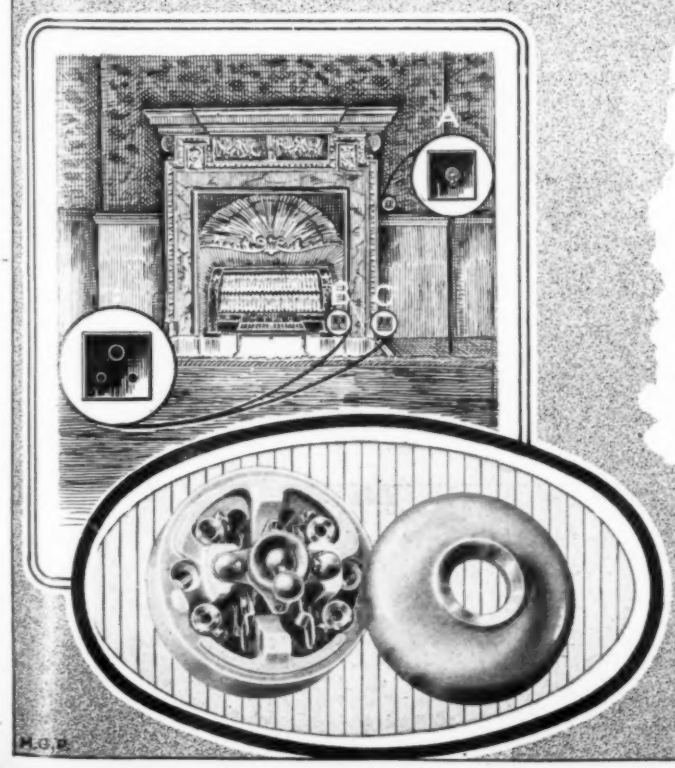

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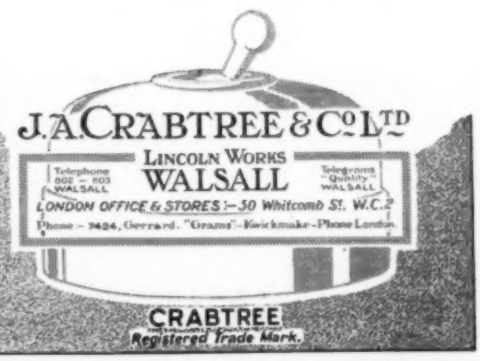

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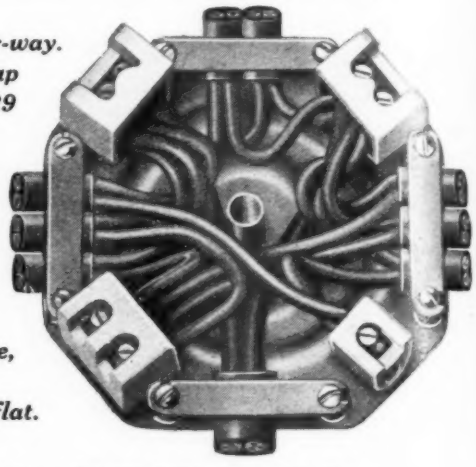

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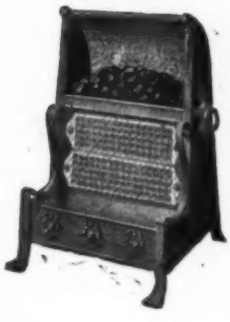

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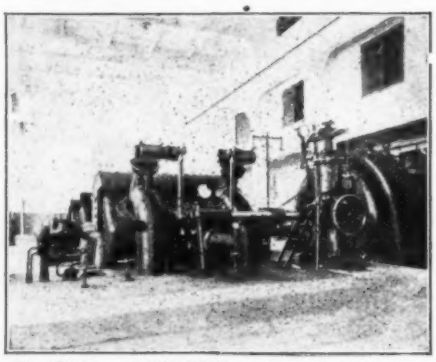

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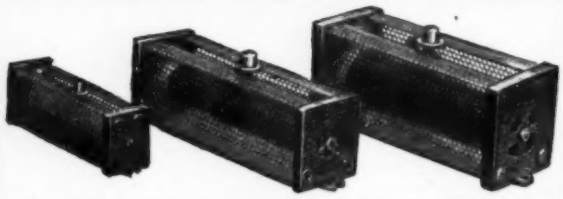

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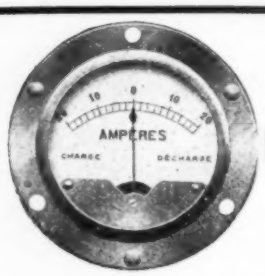

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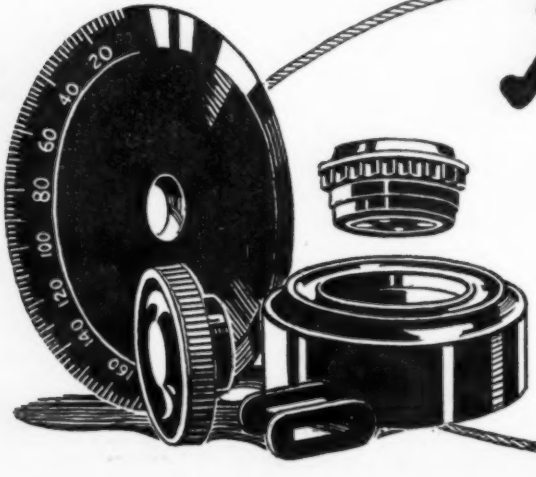

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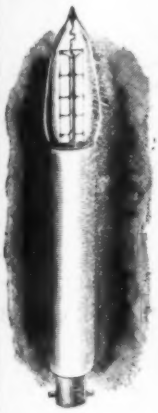

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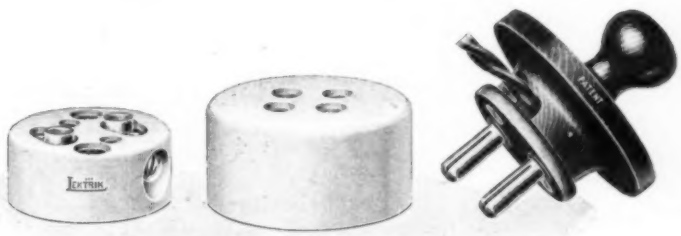

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They have been festivals indeed, and looking down the years we realise, that apart from our personal efforts in the cause of Electrical development, we could never have travelled so far along the highroad to success had we not made friends in making customers.

ONE OF THE J.P.L. PAGES

It is therefore in the spirit of friendship, not of commerce, that we tender to them once again our heartiest greetings for the Festival that is old but ever new—greetings that no elaborate phraseology can express as eloquently as do the old, old words—

A Merry Christmas and a Prosperous New Year

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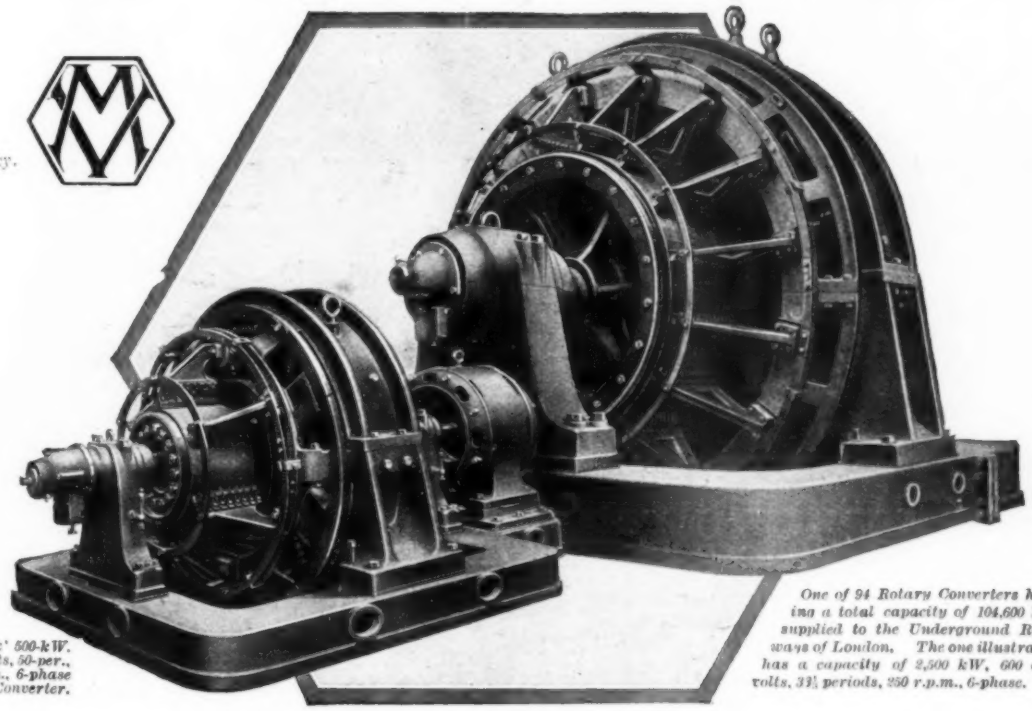

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32	17,390	Greenock Corporation.
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11	14,200	Victoria State Railways.
14	14,000	Bradford Corporation.
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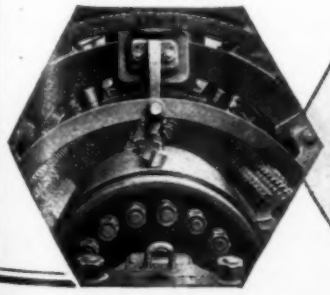

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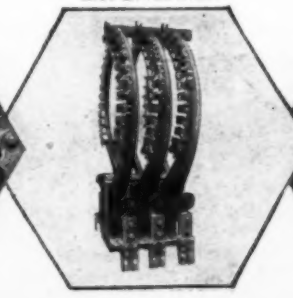

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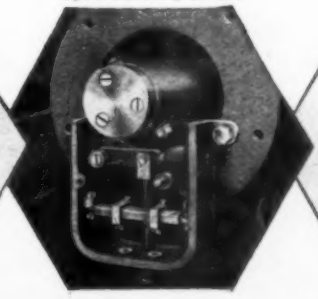
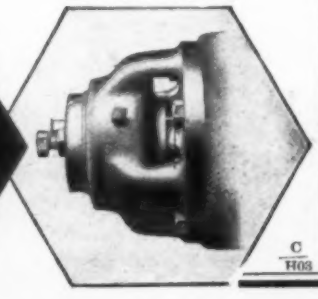


Mechanical Oscillator.



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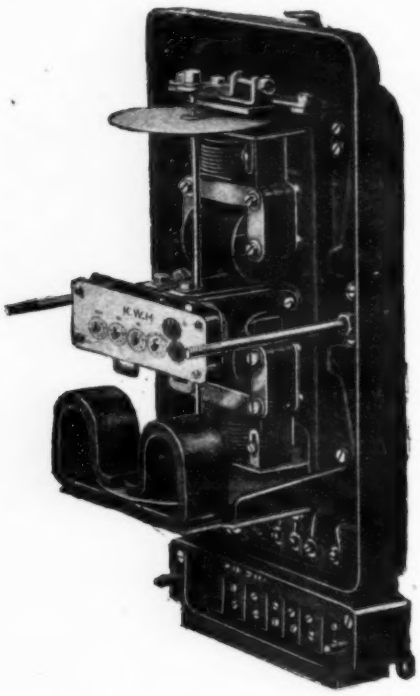

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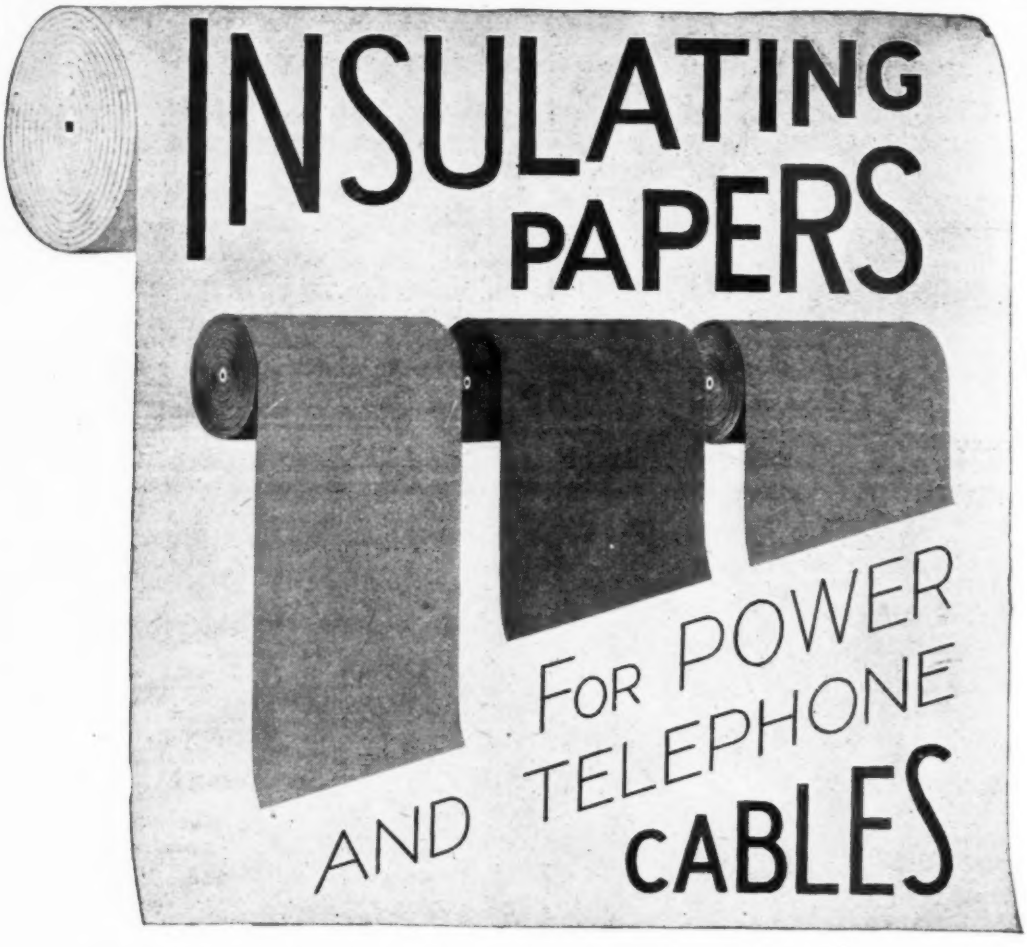

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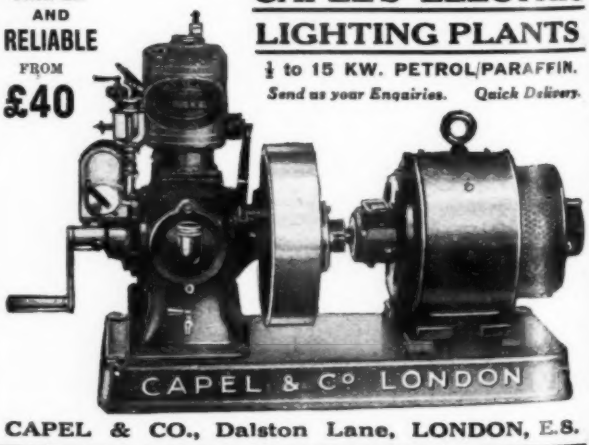

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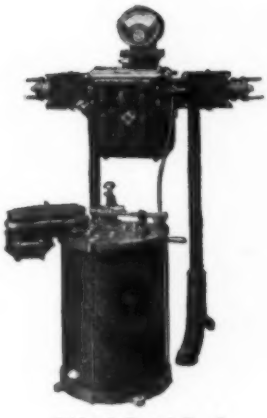

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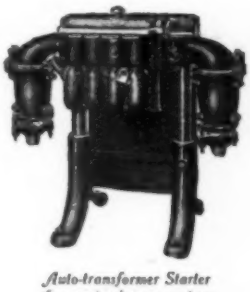

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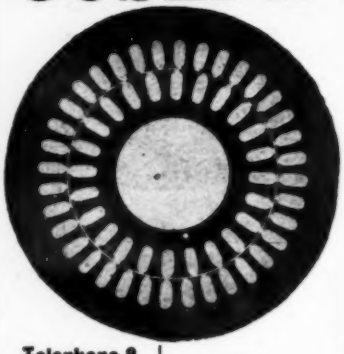

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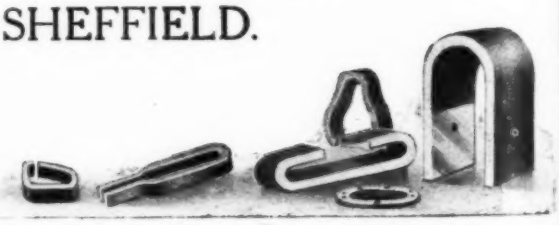

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H. LANG COATH,
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Guildhall, Swansea.
December 18th, 1924. 267

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Babington Lane, Derby. 266

SITUATIONS VACANT.—*Continued.*

THE URBAN DISTRICT COUNCIL OF ABERDARE.

Electricity and Tramways Department.

METER REPAIRER AND TESTER.

APPLICATIONS are invited for the post of skilled Meter Repairer and Tester to deal with both d.c. and a.c. meters.

Wages 1s. 4½d. per hour for 47-hour week, subject to Joint Industrial Council adjustments.

Applications, stating experience, age, and when position could be taken up, and enclosing testimonials to—

W. T. HILDER, M.I.E.E.
Engineer and Manager.

Electricity Works, Aberdare.
December 13th, 1924. 200

CONSULTING DESIGNER.

A FIRM manufacturing Induction Motors, 2 and 3 phase, squirrel cage and slip ring, up to 50 h.p., desire the services and advice of a Consulting Designer. Only one who is thoroughly competent to deal with all questions arising and with thoroughly up to date designs, need apply.—State terms and qualifications to 284, Electrical Review, 4, Ludgate Hill, London.

THE ELECTRICAL POWER ENGINEERS' ASSOCIATION.

Halifax Corporation Electricity Department.

NOTICE is hereby given that a Dispute is in operation between the above Corporation and the E.P.E.A. Before applying for any vacancies advertised by the Corporation, all engineers are requested to communicate with the undersigned.

W. ARTHUR JONES,
General Secretary.

102, St. George's Square, London, S.W.1. 6

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

A FIRST-CLASS, fully qualified and thoroughly experienced Mains Engineer required by a Power Co. for super-tension transmission, overhead and underground. Only expert mains engineers need apply, giving particulars of experience and salary required to 5519, Electrical Review, 4, Ludgate Hill, London.

AN experienced Chief Assistant Electrical Machine Designer required by large electrical manufacturers in South of England. Good prospects of advancement for suitable candidate.—Applicants to give qualifications in detail, stating types of machines on which they have been engaged, age, and salary required, to 117, Electrical Review, 4, Ludgate Hill, London.

ASSISTANT Machine Designer wanted; knowledge of rotary converters an advantage.—State experience and salary required to 261, Electrical Review, 4, Ludgate Hill, London.

ASSISTANT Sales Engineers.—We are requiring the services of two Assistant Sales Engineers. Applicants must have had good education, works training, and sales experience. —Apply by letter, stating qualifications, experience, and salary required, to F. & A. Parkinson, Ltd., Guiseley, Leeds. 197

COIL Winders and Erectors required for large transformer manufacturers in the South. Only experienced men need apply.—State qualifications, &c., to 241, Electrical Review, 4, Ludgate Hill, London.

COMMERCIAL Engineer, with knowledge of German, required by City firm of electrical engineers. Must have technical knowledge of motors, generators and switchgear and practical experience in salesmanship.—Apply, stating age, experience and salary required, to 249, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN-Constructional Engineer wanted. One who has had previous experience in the layout of generating stations and sub-stations.—Application, stating full particulars, training, past work, and experience, age, commencing salary expected, date when at liberty, together with copies of recent testimonials, to 5418, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN wanted. Senior mechanical-electrical, with first-class experience, large a.c. and d.c. machines.—Reply, stating age, qualifications, experience, and salary required, to 5467, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN wanted (London district), experienced in electrical work (precise variety not important); must be quick and adaptable. Really capable junior would be considered.—State age, experience, and salary required, to 5507, Electrical Review, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

DRAUGHTSMAN wanted with experience in Switchboard and Control Gear Diagram work. Must have test room experience.—Apply, stating age, experience and salary required, to 5431, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Engineering Draughtsman, with sound practical and technical experience in a.c. and d.c. in connection with lift equipment preferred. Qualification, salary and age to be stated.—250, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Engineer required as assistant on commercial side of electrical business. Must have technical training, works experience, knowledge of steam plant; also experienced in correspondence, estimating, interviewing (knowledge of wireless work an advantage). Only first-class applicants please apply.—Mark letters "Engineer," British Central Electrical Co., Ltd., 6-8, Rosebery Avenue, E.C.1. 263

ELECTRIC Traction Engineer.—Wanted, by large manufacturing firm, Engineer with specialised knowledge of design and manufacture of electric railway motors. Must have ability and practical experience in determination of motor requirements for specific electric traction projects. Good remuneration and excellent prospects offered. Only ambitious and progressive men with practical experience need apply. State full particulars, salary required, and earliest date commence.—288, Electrical Review, 4, Ludgate Hill, London.

EXPERIENCED Storekeeper required for transformer manufacturers in the South. Only those who have held similar posts need apply. Must be competent of carrying out card systems.—State experience and salary required to 242, Electrical Review, 4, Ludgate Hill, London.

FIRST-CLASS Wireman wanted; Gravesend district.—Apply, stating age and experience, to 5517, Electrical Review, 4, Ludgate Hill, London.

JUNIOR Designer wanted by large firm North of England; one who is used to designing small induction motors and small d.c. machines. Please state age, experience and salary required.—278, Electrical Review, 4, Ludgate Hill, London.

LINESMAN wanted for power line work in South Wales and Scotland.—Apply, with copy reference, to 204, Electrical Review, 4, Ludgate Hill, London.

METER Mechanic required for a.c. system. Wages £3 11s. 6d. per 47-hour week.—Particulars as to experience and age to H. McNaul, Electrical Engineer and Manager, Gellygaer U.D.C., Electricity Department, Bargoed, S. Wales. 126

PLUMBER-Jointer wanted, experienced in plumb-jointing e.h.t., h.t. and l.t., a.c. mains.—Applications, stating age, experience, when free to commence, and accompanied by copies of references, should be addressed to the Borough Electrical Engineer and Manager, Town Hall, Ealing, London, W.5. (District rate of pay, No. 10 Area.) 254

SWITCHGEAR Engineer required as Assistant in Engineering and Estimating Department; must have good theoretical knowledge and college training.—Apply, stating age, experience and salary required, with references, to Johnson & Phillips, Charlton, London, S.E.7. 244

TECHNICAL Assistant required, with engineering or scientific training. Age 20-26.—Letters only in first instance, giving full particulars, to Cosmos Lamp Works, Ltd., Brimsdown, Enfield Highway, Middlesex. 205

TESTING. Young man with electrical knowledge. Preferably with meter experience. State age, experience and approximate salary.—279, Electrical Review, 4, Ludgate Hill, London.

THOROUGHLY competent Electrician required. Applicant must have knowledge of automobile equipment and possess good references. Constant job for right man, for small town 20 miles north-west of London.—5506, Electrical Review, 4, Ludgate Hill, London.

WANTED, by electric supply undertaking, Assistant in mains department, with high-tension overhead mains experience. Able to undertake construction and maintenance of overhead work.—Apply, stating age, training, past experience, commencing salary required, when at liberty, with copies of recent testimonials, to 5500, Electrical Review, 4, Ludgate Hill, London.

WANTED, experienced Man for accumulator repairs, lead burning, &c., at least three years' experience.—Write, giving experience, age, if married, and salary required, to the Radio & Battery Service Co., 7, Queen Street, Belfast. 5508

YOUNG Assistant for Design Office of firm manufacturing centrifugal pumps; one familiar with single stage pumps in particular required. Good prospects for suitable man.—State age, experience and salary required, to 282, Electrical Review, 4, Ludgate Hill, London.

APPOINTMENTS FILLED.

Dissatisfaction having been so often expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled may we suggest that advertisers notify us to that effect when they have arrived at a decision. We will then insert a notice free of charge under this heading.

CORPORATION of Worcester (Switchboard Attendant); Box 5304 (Representative); Box 57 (Chief Clerk); County Borough of Gt. Yarmouth (Mains Assistant); Jackson Electric Stove Co., Ltd. (Tester); Clacton Urban District Council (Battery Attendant).

SITUATIONS WANTED.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

ADVERTISER, age 23, at present in Brussels, seeks progressive position home or abroad; 3 years' accountancy and commercial experience, 6 years' electrical, England and Belgium, including automobile work; London C. and G. Inst. Diploma; speaks French; knowledge of i.c. engines.—5404, Electrical Review, 4, Ludgate Hill, London.

ADVERTISER, 20 years' engineering experience, switch and control gear, automatic sub-stations, high speed circuit breakers. Design and sales experience. Desires responsible position.—5397, Electrical Review, 4, Ludgate Hill, London.

ADVERTISER (38) requires appointment. Experienced in all branches of factory records, including four years as works manager's assistant in micanite insulation manufacturers, assisting with organisation generally.—Harrison, 21, Greenwood Road, Dalston, E.8. 5445

AGE 34, Electrical and Mechanical experienced Marine Engineer and Chief Electrician principal steamship company desires progressive position, factory, plant, or similar; d.c. or a.c. General knowledge all classes electrical work.—5509, Electrical Review, 4, Ludgate Hill, London.

ARMATURE Winder, first class; new or repairs. Over twenty years' experience.—5421, Electrical Review, 4, Ludgate Hill, London.

ARMATURE Winder, 20 years' experience a.c. and d.c. Would take charge new work or repairs.—5469, Electrical Review, 4, Ludgate Hill, London.

ARMATURE Winder, a.c. or d.c.; 14 years' experience; repetition or repair.—5522, Electrical Review, 4, Ludgate Hill, London.

ASSISTANT Manager and Engineer to well-known firm of electrical engineers seeks new engagement; estimating, obtaining orders, supervising installations, controlling maintenance contracts and office routine for power, lighting, telephones, &c.—5401, Electrical Review, 4, Ludgate Hill, London.

BUSINESS Organiser and Manager with successful record. Large and influential connection throughout the British Empire. First-class references from previous long engagements; technical expert.—5489, Electrical Review, 4, Ludgate Hill, London.

CAPABLE and experienced Draughtsman and Technician seeks responsible position with consulting or switchgear engineers or as Working Partner in new business with a view to acquiring a financial interest. Wide practical and commercial experience; good organiser.—5412, Electrical Review, 4, Ludgate Hill, London.

CONTRACTING, Electrical. Advertiser (35), single, good technical and commercial knowledge electric light and power contracting, a.c. and d.c., including Drawing Office, Estimating, Specification work, costing, buying, correspondence, office routine. Good education, ambitious, salary moderate, any district.—5408, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL and Mechanical Engineer, having completed large Contracts (Far East), desires appointment; Government and public works contracts, lighting and power plants, mill, factory, and printing equipments, tunnelling, sewage, compressed air, country house installations; excellent testimonials; (ex-officer).—5459, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL and Mechanical Engineer, Student I.E.E., University Graduate (28), seeks any change with prospects; 9 years' engineering and commercial experience. At present test engineer with large American Hydro Electric Co. Meters, instruments, relays, transformers, h.t. switchgear, motors, &c. Linguist; excellent references. Free early 1925. —5434, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Engineer, A.M.I.E.E., age 28, recently returned from Latin America, desires progressive situation home or abroad (preferred); speaks Spanish. Hydro-electric, general all-round experience, and excellent references.—5485, Electrical Review, 4, Ludgate Hill, London.

SITUATIONS WANTED.—*Continued.*

ELECTRICAL Engineer (23) seeks progressive position; 4 years' technical training (dip.); experience mechanical, e.h.t. and l.t. power and sub-stations.—5511, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Engineer (disengaged), good all round; complete plants, installations, L.C.C. contracts, &c.; 24 years' experience; abstainer.—5416, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Engineer requires responsible position. Extensive experience, collieries and factories, construction and maintenance; sound technical training. Excellent references.—5409, Electrical Review, 4, Ludgate Hill, London.

ELECTRICIAN, 18 years' experience, lighting and power; all wiring systems.—A. W. D., 224, Great College Street, N.W.1. 5428

ELECTRICIAN seeks charge of mansion or private plant; working and technical experience. Steam, gas, oil-maintenance, layout and extensions.—5524, Electrical Review, 4, Ludgate Hill, London.

EXPERIENCED Maintenance Engineer shortly disengaged; electric lighting, 'phones, bells, plant, including battery repairs and plumbing, gas, steam, hot-water fitting and heating; first-class testimonials.—Jennings, Engineer, Bentley Priory, Stanmore, Middlesex. 5523

METER Tester and Repairer requires situation; experienced; d.c., single and polyphase; sound technical training.—5484, Electrical Review, 4, Ludgate Hill, London.

SHORTHAND-Typist desires re-engagement. Five years with consulting engineers (electrical and civil).—C., 49, Alexandra Road, Gipsy Hill, S.E. 5427

WIREMAN, all branches, wants work.—Haines, 4, Seaton Street, N.W.1. 5420

WORKS Manager, having specialised in works costs and economical production with successful companies, is open for engagement; highest references and testimonials.—5490, Electrical Review, 4, Ludgate Hill, London.

YOUNG Electrical Engineer (26), requires progressive post. Seven years' experience meter work (all branches). Good general electrical knowledge, both practical and technical. Would prefer post as representative.—Wilson, 304, North End Road, Fulham. 5400

YOUNG Man (20), 2 years' d.c. station experience, charge of shift, wants similar post or improver; willing; commence any time; good references; nominal salary.—Buckingham, Bittadon, Barnstaple. 5513

MINISTRY OF LABOUR.

The Proprietors of the ELECTRICAL REVIEW have placed this space at the disposal of the District Director, Ministry of Labour, 3 and 4, Clement's Inn, Strand, W.C.1, to whom all replies should be addressed, quoting number of advertisement, the date on which it appeared, and the name of this paper.

CAPTAIN, R.E.—Age 47, married, 4½ years' war service. Constructional engineer. 20 years' practical experience on railways, docks, bridges, hydraulic installations, screw-piling, ordinary and tacheometric surveying. Carried out extensive works in India, Burma, Egypt, Africa, &c. Four years' practical mechanical workshop practice; also good knowledge of electricity. Willing to take any post. (444/21/Eng.)

ELECTRICAL and Mechanical Engineer.—Age 30, married, 4½ years' war service; educated Public School, University, B.A. Engineering (Cantab.). Thorough knowledge all branches mechanical and electrical engineering, sound technical, practical and commercial experience. Willing to take any progressive post. (2886/23/Eng.)

MAINTENANCE Engineer, Mechanical and Electrical.—Married, war service; 23 years C.E.R.A., 1st Class R.N. Experience maintenance, operation and general repairs, electrical and mechanical plant. Is willing to take any post. (3814/24.)

ELECTRICAL.—Age 26, war service; educated Public School and University; 3 years' technical course (electrical) certificates, served regular apprenticeship. Good experience electrical instrument makers, with whom a post is desired. Good knowledge of clerical work. Willing to accept small salary until worth is proved. (2937/24/TP.)

ELECTRICAL Engineer.—Age 49, married, war service, Major R.E. M.I.E.E., served regular apprenticeship; sound experience electrical engineer, South African Railways; has been in practice on own account as consulting engineer (electrical and mechanical); thorough knowledge of accounts, shorthand-typing, good correspondent. (3157/24.)

ELECTRICAL.—Age 33, war service; sound training electrical, mechanical engineering; Sheffield University; good knowledge of machine and hand tools; seeks junior post with machine tool or electrical firm. (93084/Eng.)

EX-OFFICER.—Age 27, married, well educated, good personality and conversationalist, desires position as Traveller; 7 years' electrical experience; willing to go abroad. (18374.)

FOR SALE.

Advertisements are inserted under this heading at 14s. per inch.

TRANSFORMERS AND MOTORS. IN STOCK.

New and Equal to New, at Low Prices.

600 kVA, 6,600/440 volts, 50 periods, 3-phase.
40 kVA, 5,125/110 volts, 25 periods, 3-phase.
675 kVA, 6,600/440 volts, 25 periods, 3-phase.

MOTORS, 400/440 VOLTS, 3-PHASE, 50 PERIODS.
200 h.p., 100, 12½, 10, 7½, 7, 5, 4, 3 h.p.

MOTORS, 400/440 VOLTS, 3-PHASE, 25 PERIODS.
90 h.p., 75, 60, 50, 25, 22, 20, 15, 12, 10, 8, 7½, 6, 5, 3, 2 h.p.

MOTORS, 200 VOLTS, 2-PHASE, 50 PERIODS.
100 h.p., 14, 7, 5 h.p.

MOTORS, 200 VOLTS, 3-PHASE, 50 PERIODS.
5 h.p., 10 h.p.

MOTORS, 500 VOLTS, D.C.
50 h.p, 20, 15, and 8 h.p.

MOTORS, 440/460 VOLTS, D.C.
40 h.p., 15, 14, 13, 12, 7½, 5 h.p.

MOTORS, 220/250 VOLTS, D.C.
20 h.p., 15, 10, 7½, 5, 4, 3 h.p.
3 h.p., coupled to 1½ in. Centrifugal Pump.
10/12 h.p., coupled to 5 in. Centrifugal Pump.

DYNAMOS, 220/250 VOLTS, D.C.
34 kW, 21, 15, 8, 9.5 kW.

DYNAMOS, 110/120 VOLTS, D.C.
52, 18 kW, and 16 h.p., 15 h.p., 7½ h.p. Motors.
4.2 kW, 60 amp., 70 volts.
26 kW, 110 volts, Parsons-B.T.H. Paraffin Set.
Seam Welder by B.I. Co. and Spot Welder, "Vulcan."

PLATING DYNAMOS.
750 amp., 12 volts, 4-pole.
1,000 amp., 12 volts, 4-pole.

MOTOR GENERATORS.
24 kW, 220 volts; 5/120 volts, 200 amps.

STARTER.
200 h.p. Liquid, 3-dipper type.

CABLE.
100 yards, .55 sq. inch, P.L.A., new on drum.

Switchboard Panels, Circuit Breakers, Voltmeters, H.O. Distribution Fuse Boards, &c., &c.

Above plant is in our own stock, and is fully guaranteed. Inquiries solicited.

MIDLAND COUNTIES ELECTRICAL ENGINEERING CO., LTD.,
136, Sandon Road, Birmingham.
Telegrams: Rheostat, Birmingham. 31

COUNTRY HOUSE PLANT FOR DISPOSAL.

OWING to the change-over to public supply the following plant, which is in thorough good running order, is for disposal.

The plant is situated in the Middlesbrough district and comprises:—

One National Gas Engine, No. 19819, 31½ b.h.p., complete with flywheel, coupled to Scott & Mountain d.c. Generator, 140 volts, 130 amps., approximately 900 r.p.m.

One Anthracite Gas Producer, suitable for the above engine.

One Switchboard complete with charge and discharge regulating switches, four distribution switches, "Neville" type circuit breaker, instruments, &c.

One Pritchett & Gold and E.P.S. Accumulator, comprising 55 cells, type C, size 25, capacity 72 amps. for 10 hours.

Purchaser will be required to dismantle and remove at his own expense.

Offers and applications to inspect, apply to 273, Electrical Review, 4, Ludgate Hill, London.

MACHINERY FOR SALE.

COMPLETE 50-volt Lighting Installation, including 8-h.p. horizontal Crossley gas engine, magneto ignition, cooling tank, gas bag, and all connections; Westinghouse dynamo, switchboard, large battery, approximately 250 amperes, regulator, nearly new 5-in. Balata driving belt, also about 50 lamps. Whole plant may be examined at work any time. Engine and dynamo insured by National Boiler Insurance Co., and examined regularly by their engineers. Price £150 or near offer.—Apply Rice & Harper, Ltd., Guildford. 5512

GENERATING SETS, 50 kW.

EACH comprising a 100-h.p. "Aster" petrol-paraffin engine, direct-coupled to a Siemens Generator, with cooling tanks and high-grade, three-panel switchboard. Brand new. In stock, any voltage, 80/550, and in d.c. and a.c., 3-phase, 50-period types, at less than half manufacturers' price. Inspection Spalding.—Farrow & Sons, Ltd., Spalding. 4607

FOR SALE.—*Continued.*

MARPLE & GILLOTT, LTD.,

Electrical Department, Stevenson Road, Attercliffe, Sheffield.
Telegrams: "Ferric." Telephone: Attercliffe 301.

D.C. GENERATORS.
One Mather & Platt, 320 amps., 740 revs., 110 volts.
One Vickers, 200 amps., 600 revs., 110 volts.

MOTORS.
One 5 h.p., 1,600 revs., 110 volts, shunt, B.T.-H.
One 4 h.p., 1,100 revs., 110 volts, shunt, Crompton.
Three 10 h.p., 625 revs., 220 volts, shunt, Greenwood & Batley.
Three 20 h.p., 450 revs., 220 volts, shunt, Vickers.
One 70 h.p., 820 revs., 500 volts, compound interpole, Scott and Mountain.
One 55 h.p., 650 revs., 500 volts, 4 pole compound, with spare armature, Scott & Mountain.
One 15 h.p., 960 revs., 200 volts, 2 phase, Westinghouse.
Two 1 h.p., 1,400 revs., 200 volts, 2 phase, Westinghouse.

All machines are thoroughly overhauled and tested before dispatch. 287

Three 120-kW Steam-Electric Generating Sets.

ENGINES, Jensen & Dahls (Thune, Norway) make, compound with jet condensers, Edwards type air pumps, Hartungs governor, 180 r.p.m. Schuckert generators, shunt wound for 440/500 d.c., complete with switchgear. Two boilers for the above; water tube, 2,160 sq. ft. heating surface each, 145 lb./inch; Meldrum mechanical stokers, complete with all accessories. The units as a whole are in excellent condition, almost as new. Cause of sale, going over to water-power, a.c. The machinery can be seen running. Price wanted, £2,000 for the lot. Can also be sold separately.

For details apply 286, Electrical Review, 4, Ludgate Hill, London, E.C.4.

FOR SALE.

TWO complete Electric Generating Sets, comprising:—

National Suction Gas Engines and Producers, 34 h.p., coupled direct to two compound, shunt, d.c. dynamos, 220/250 volts, 87 amps., 225 revs.

Also

120 Chloride Cells, 240 amps. Higher capacity, with motor generator for charging. Motors, Switchgear, &c. Can be seen working.

Apply Great Harwood Co-operative Society, Ltd., Great Harwood, Blackburn, Lancs. 14

MOTORS AND FANS.

200/250 volts, d.c.: 3, 5, 7, 8, 10, 15, 18, 20, 25, 50, 70, and 100 h.p.
400/500 volts, d.c.: 5, 10 (tot. encl.), 15, 20, 25, 30, 40, 65, 70, 75, and 90 h.p.
400/500 volts, 3-phase, 50 periods: 1, 2, 4, 6, 10, 12, 18, 20, 25, 40, 50, 75, and 100 h.p.
200 volts, 1-phase, 50 periods, 18 h.p., slip-ring.
Ventilating Fan, 30 in., 230 volts, d.c., box bladed.

GREENHALGH BROS., Atherton, Manchester.
'Phone: 117. Telegrams: Greenhalgh Bros., Atherton. 7

STEAM GENERATING SETS.

300 kW, 500 volt, d.c., Belliss-B.T.-H.
200 kW, 220 volt, d.c., Allen.
75 kW, 500 volt, d.c., Allen.
25 kW, 220 volt, d.c., Belliss.
25-50-100 kW, 110 volt, d.c., Allen.
HARRY H. GARDAM & Co., LTD., Staines. 18

BRISTOL CORPORATION ELECTRICITY DEPARTMENT.

FOR Sale, a number of continuously rated Direct Current Motors, second-hand, but in working condition. Complete list on application. Offers for the whole or any portion invited.

H. FARADAY PROCTOR,
Chief Engineer and General Manager.
Colston Avenue, Bristol. 202

HIRE OR SALE.

ELECTRIC Motors and Dynamos.—Machines always available. ARMATURES and FIELD COILS rewound or repaired without delay.

'Phone: Museum 8080. MACDONALD, SYER & CO., LTD., 295, Gray's Inn Road, W.C.1. 2

Re Electrico, Ltd. (in Voluntary Liquidation).

FOR Sale, by private treaty, the whole of the Stock-in-trade of the above company, estimated to have cost about £4,000. May be viewed on the premises, 139, Bournemouth Road, Parkstone, Dorset, by appointment with the undersigned. List of the principal items forwarded on application. F. G. Wheatley, F.C.A., 102, High Street, Poole, Dorset. 260

FOR SALE.—*Continued.*

CITY OF YORK.

Electricity Department.

THE undermentioned superseded plant installed at the Corporation Electricity Generating Station, Foss Islands Road, York, is offered for sale:—

One 1,250-kW, B.T.H., 3-phase Turbo Generator, 3,000 r.p.m., 3,300 volts, complete with Worthington Surface Condenser.

The plant, which will be released in February, 1925, was installed in 1912, is in excellent condition and can be inspected on load by appointment.

The dismantling and removal of the plant to be carried out by the purchaser at his own expense and risk.

The use of an overhead travelling crane will be allowed free, the purchaser to accept all responsibility for any damage done to buildings or other plant in the station.

Further particulars and permit to inspect may be obtained from the undersigned, to whom all offers should be addressed. Offers to be endorsed "Tenders for Plant," and must be received on or before Wednesday, January 7th, 1925.

The highest or any tender will not necessarily be accepted.

E. J. NICHOLS, A.M.I.E.E.,
City Electrical Engineer.

Electricity Offices,
Clifford Street, York. 190

PLYMOUTH CORPORATION.

THE Plymouth Corporation is prepared to receive tenders for the purchase and removal from the Electricity Works of

6 Lancashire Boilers and Fittings.

Specification and form of tender may be obtained on application to the undersigned not later than December 31st, accompanied with a deposit of 20s., which will be returned after receipt of a *bona fide* tender.

The Corporation does not bind itself to accept the highest or any or the whole of any offer.

E. G. OKELL,
Borough Electrical Engineer.

Electricity Works,
Prince Rock, Plymouth.
December 15th, 1924. 220

ENGINES FOR SALE.

ONE 1,000-kW Set, Howden-Westinghouse, Triple Expansion Engine, cylinders 20½ in., 31½ in., 49 in., by 23 in. stroke, 180 r.p.m., steam pressure 160 lb., complete with surface condenser and air and circulating pumps. Generator, d.c., 500/550 volts, 6-pole.

One 1,000-kW Set, Belliss-Siemens, Triple Expansion Engine, cylinders 22 in., 32 in., 48 in., by 24 in. stroke, 230 r.p.m., steam pressure 160 lb., complete with surface condenser, air and circulating pumps. Generator, d.c., 500/550 volts, 6-pole.

Apply Stretford U.D.C. Trafford Power Station, Trafford Park. 184

MACHINERY FOR SALE.

3-phase, 50 cycles, 400/440 volts: 42 and 22 h.p.
3-phase, 40 cycles, 440 volts: 400 and 45 h.p.
D.C., 220 volts: 70, 30, 25, 20, and 15 h.p.
D.C., 460 volts: 35, 30, 20, and 12 h.p.
Special M.G., 50 cycle, a.c. to d.c.; 50/25 volts, 120/240 amp.

DRUMMOND & CO., Middlesbrough. 17

ELECTRIC MOTORS AND DYNAMOS.

WE hold one of the largest stocks of new and second-hand Motors. Second-hand machines are thoroughly overhauled. Inspection and tests can be made at our works. For sale or hire, send your inquiries to Messrs. Britannia Manufacturing Co., Ltd., Registered Office and Works, 22-26, Britannia Street, City Road, London, N.1. Telephone: 5512 and 5513, Clerkenwell. 8

DIRECT COUPLED PETROL-PARAFFIN SETS.

18 kW, Austin-Electromotors, 100/110 volts, d.c.
Two 10 kW, Aster-E.C.C., 100/110 volts, d.c.
8 kW, Austin-Verity, 220 volts, d.c.
Four 4.5 kW, Austin-B.T.-H., 100/110 volts, d.c.
Also a number of 220-volt, d.c. Motors, 2-25 h.p.
All as new and seen in London by appointment.

F. WINKWORTH & Co., 137, Victoria Street, S.W.1. Tele: Victoria, 8362. 41

Advertisements are inserted under this heading at 1s. 9d. per line.

A.C. and d.c. Motors. The Pioneer House for tested and guaranteed machines.—Electro-Generator Co., 1a, Shepherd's Bush Road, Hammersmith, W.6. (Riverside 488.) 5025

ALTERNATORS, 50/90 kW. Brand new Siemens, 200/520 volts, three-phase, 40/50 periods, complete with exciters and switchboards, for sale very cheaply.—Farrow, Spalding. 9

AUSTIN 8-kW Petrol-driven Set, 2-cylinder engine, 80-volt dynamo, by Electromotors; 4 poles, compound, with switchboard. In stock.—Thomas Mitchell & Sons, Ltd., Bolton. 257

FOR SALE.—*Continued.*

BOILER Feed Pumps, by Weir, for boiler pressures up to 250 lb. per sq. inch, capacities 10,000, 8,000, 6,000, 4,000, 3,000, and 2,000 gallons per hour.—Harry H. Gardam & Co., Limited, Staines. 26

BRAND new 1-kW Lighting Plant, comprising 3-h.p. four-stroke engine, direct coupled to dynamo, slate switchboard. 108-ampere-hour battery of English manufacture. £70 complete, or generating set only £50.—W. Richards & Son, Leicester. 251

CARBONS, Searchlights, Mirrors, Lenses, Wire Ropes, half price.—The London Electric Firm, Croydon. 19

ELECTRIC Cables, 7/16, 7/18, 7/22, 7/24, best British makers; further reductions in prices.—Lake, 44/47, Devonshire Street, Theobalds Road, London, W.C.1. 5446

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10-H.P. variable speed d.c. Motor, by Westinghouse, 460 volts, 600/1,200 revs., 4 poles and interpoles, shunt, with starter and speed regulator.—Thomas Mitchell & Sons, Ltd., Bolton. 255

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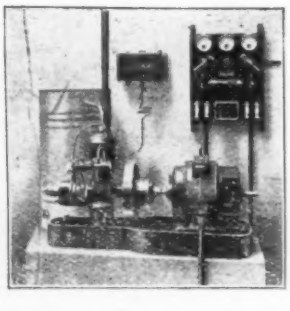

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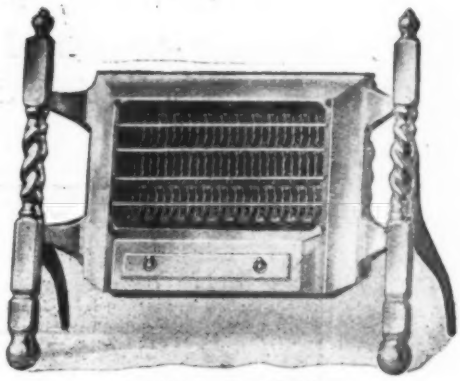

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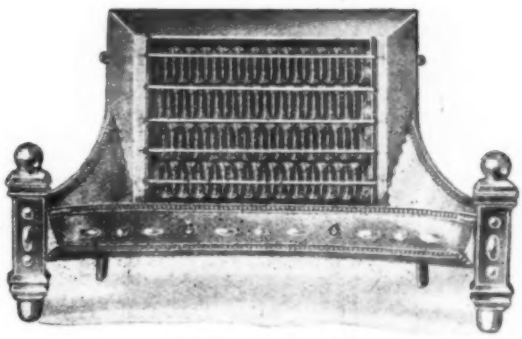

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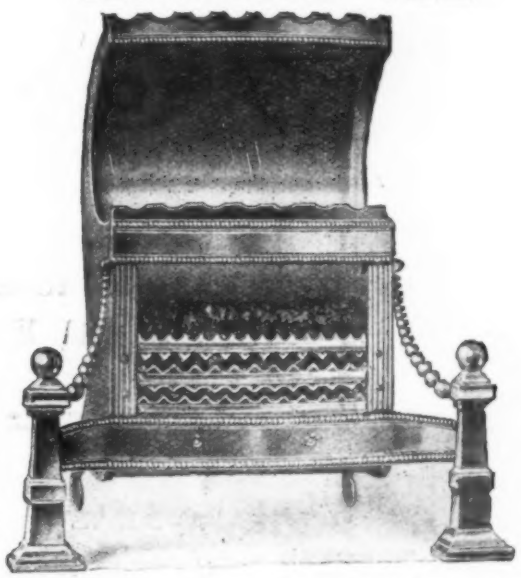

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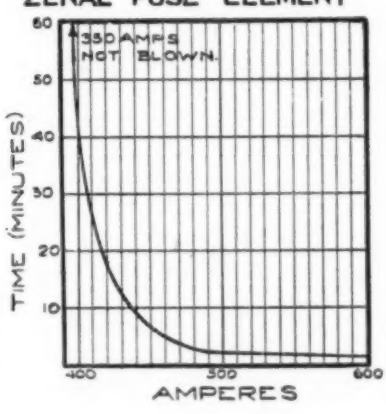

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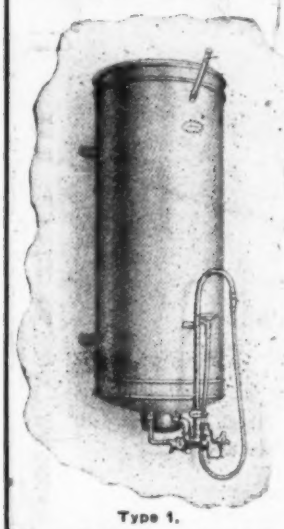

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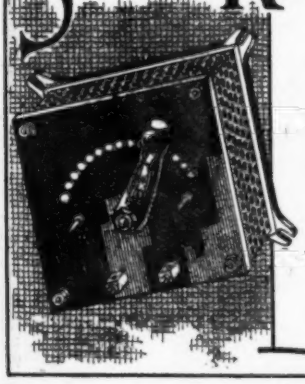

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Edison Swan Electric Co., Ltd.

The Forty-First Ordinary General Meeting.

THE forty-first ordinary general meeting of the Edison Swan Electric Co., Ltd., was held on Wednesday, December 17th, at the Cannon Street Hotel, E.C. Mr. C. F. Spencer (chairman of the company) presided. The Chairman, in moving the adoption of the report and accounts, and the payment of the dividend as recommended, said that sums of £14,418 and £3,015 had been appropriated out of the sinking fund to the redemption of first and second debenture stocks respectively, whilst the sinking fund had been increased to £24,873. The net debt on first and second debenture stocks was £312,786 on June 30th, 1924, and the interest accrued thereon was £5,340. On June 30th, 1923, the debt due to the bankers was £314,150, but during the last completed year £109,000 had been paid off. Further repayments had been made since July 1st of the current year, and they hoped to made additional reductions early in the New Year.

There was a balance of profit, after providing for general expenses, &c., of £122,140. Out of that sum they had set aside £10,000 as reserve for bad and doubtful debts, &c., whilst loan charges had absorbed £37,225, leaving a net profit of £74,914. They were proposing to pay a dividend of 10 per cent. on the ordinary shares, being an increase of 2½ per cent. on last year's dividend, and to allocate £50,000 to the reserve fund. After making such appropriations there remained a sum of £17,575 to carry forward to the current year's account, and that sum would more than cover any sums payable in respect of corporation profits tax.

The board's policy was to build up reserves and reduce debts, and since the board was reconstituted some two years ago a sum of £80,000 had been placed to reserve account, whilst debenture and other loan debts had been reduced by £127,433. He looked forward with pleasurable anticipation to the time when the charges for loan interest would be substantially reduced as a result of their policy.

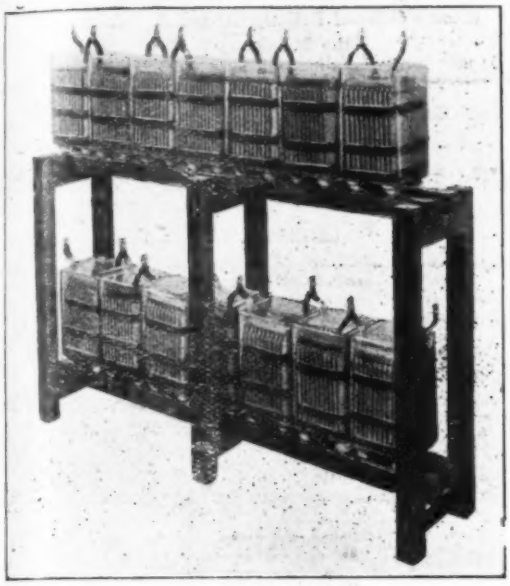
With regard to the present year's trading, the turnover and profit for the five months to November 30th last showed a substantial increase on the figures for the corresponding period of 1923. Every phase of the company's activities and operations had been carefully examined, resulting in substantial economies in the cost of production at the works. Unproductive expenses had been substantially reduced, whilst sales had been augmented by the carrying out of an intensive sales policy, and efficient co-operation had been established in all sections of the business. Their system of officials meeting in committees had more than justified the confidence placed in it, and they had now in operation a method by which production and distribution were conducted in complete accord.

They must not be unmindful of the possible effects on their business of foreign competition. Many of their foreign competitors' works were situated in countries having a depreciated currency, which placed a weapon in foreign producers' hands against which manufacturers in this country were commercially powerless. For instance, assuming that the currency of a country was 20 units to the £ in pre-war days, and now was depreciated to 80 units to the £, they found that wages in such a country had not risen in the same ratio as the currency had depreciated. Consequently many foreign producers were able to manufacture at 30 per cent. less labour costs than manufacturers in this country, and, when standing charges were added, the disparity between the total cost of the foreign product and the British product was even more marked. Industry should be protected against such unfair competition, at least until exchanges became more normal, and for that reason he would welcome the introduction of a Safeguarding of Industries Bill.

During the past two years they had been able to make moderate profits, and he knew no reason why they should not do so during the current year; but he saw evidence of foreign competition making inroads into profits at no very distant date, unless some legislation safeguarding some of the industries in which they were engaged was adopted.

Mr. A. F. Berry (deputy-chairman) seconded the resolution, and it was carried unanimously.

ACE BATTERIES



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(180 A.H. at 10 hour rate.)

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which lie flat against the positive plates and prevent the disintegration of fine particles of peroxide; allow free circulation of acid and escape of gas bubbles.

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Catalogue "L" ACE—House Lighting Batteries.
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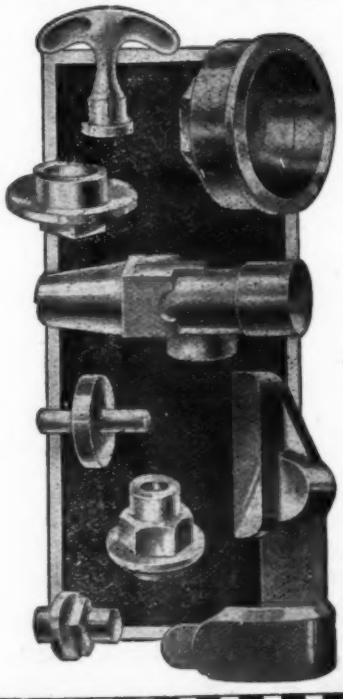
Crescent Works, LUTTERWORTH.



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afford to run risks by incorporating in their products components of an inconstant quality, the "McKechnie" Non-Ferrous Pressings and Stampings Department—with its ripe experience and efficient plant—can supply articles of an unexcelled quality at keen prices.

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We can give early deliveries of Brass and Bronze Pressings and Stampings, to customers' own designs and specifications, ranging in weight from 1 oz. to 6 lbs.

Send for our Pressings Folder B 42, or write for prices and sample, so that you can compare "McKechnie" quality and costs.

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LEEDS—Prudential Buildings, Park Row.

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OFFICIAL NOTICES.

Latest time for receiving, 5 p.m. Tuesday.

BOMBAY, BARODA & CENTRAL INDIA RAILWAY CO.

Electrification of Bombay Suburban Lines.

THE Directors are prepared to receive tenders for the supply of the following plant:—

Impedance Bonds for Track Circuiting.

Fee for specification £2 per copy.

Specifications and forms of tender (which must be submitted in duplicate), may be obtained at this office on payment of the fee for the specification, which payment will not be returned.

Tenders must be sealed and addressed to the undersigned, marked "Tender for Impedance Bonds," and delivered not later than noon on Tuesday, January 20th, 1925.

The fee should accompany any application by post. Cheques and postal orders should be crossed and made payable to the Bombay, Baroda and Central India Railway Company.

The directors do not bind themselves to accept the lowest or any tender.

The Consulting Engineers, to whom application for any further technical information may be made, are Messrs. Merz and McLellan, 32, Victoria Street, Westminster, S.W.1.

S. G. S. YOUNG,
Secretary.

Offices: The White Mansion,
91, Petty France, Westminster, S.W.1.
December 18th, 1924. 272

BOROUGH OF HORNSEY.

THE Town Council are prepared to receive tenders for the supply and erection of a Battery Regulator and Electrical Control at their Generating Station.

Forms of tender, &c., may be obtained from the Borough Electrical Engineer, Electricity Works, Tottenham Lane, Hornsey, N.8, after 10s. 6d. has been deposited with the Borough Treasurer. This deposit will be refunded to *bona-fide* tenderers.

Tenders, endorsed "Tender for Battery Regulator," to be delivered or sent by post to me at the Town Hall by noon on Thursday, January 15th, 1925.

The Council do not bind themselves to accept the lowest or any tender.

E. B. CROASDELL,
Town Clerk.

Town Hall,
Southwood Lane, Highgate, N.6.
December 19th, 1924. 271

URBAN DISTRICT COUNCIL OF DARTFORD.

Extensions to Electricity Undertaking.

TENDERS are invited for the supply, delivery and erection of the following:—

(1) Artesian Well.
(2) 750-kW Rotary Converter and Transformer.
(3) Extra High Tension and Direct Current Switchgear.

Copies of specification and forms of tender may be obtained from the Electrical Engineer, Electricity Works, Dartford.

Tenders endorsed "Electricity Works Extensions," must be delivered to the undersigned not later than the 17th January, 1925.

The Council do not bind themselves to accept the lowest or any tender.

J. JAMES HURTLEY,
Clerk to the Council.

Council Offices, Dartford.
December 19th, 1924. 275

COUNTY BOROUGH OF BOURNEMOUTH.

TENDERS are invited for Wiring, &c., of the Sanitary Hospital, Gloucester Road, for Electric Light. (The specification also includes for a scheme for a Generating Plant.)

Full particulars, form of tender and specification can be obtained of the Borough Engineer, Mr. F. P. Dolamore, on and after Tuesday, December 16th, provided that the sum of £1 1s. has been previously deposited with him, which deposit shall become forfeited unless a tender complying with the conditions is sent in.

Tenders to be sent in (in envelopes provided for the purpose) to the Town Clerk (H. Ashling, Esq.), not later than noon of Friday, January 9th, 1925.

The Council do not bind themselves to accept the lowest or any tender.

F. P. DOLAMORE, F.S.I., F.R.San.I.,
Borough Engineer and Surveyor.

Town Hall, Bournemouth.
December, 1924. 268

OFFICIAL NOTICES.—*Continued.*

INDIA STORE DEPARTMENT.

THE Director-General, India Store Department, Branch No. 36, Belvedere Road, Lambeth, S.E.1, requires:—

Electric Cells for Railway Carriages. 9, 15, and 21 plates.

Tenders due on the 2nd January, 1925.
Tender forms obtainable from above. 265

MANCHESTER CORPORATION ELECTRICITY DEPARTMENT.

THE Electricity Committee invite tenders for the supply and delivery at the Polygon Depôt, Ardwick, Manchester, of

62 Electric Wash Boilers.

Specification and form of tender may be obtained from Mr. S. L. Pearce, Manager, Electricity Department, Town Hall, Manchester.

Tenders, duly endorsed and addressed to the Chairman of the Electricity Committee, must be delivered at the Town Hall not later than 10 a.m. on Saturday, the 3rd January, 1925.

The Corporation do not bind themselves to accept the lowest or any tender.

P. M. HEATH,
Town Clerk.

Town Hall, Manchester.
December 18th, 1924. 269

NOTICES RELATING TO PATENTS.

Advertisements are inserted under this heading at 14s. per inch.

THE Proprietor of Patent No. 172,015, for "Improvements relating to Liquid-cooled Electric Machines," is desirous of entering into arrangements by way of licence and otherwise on reasonable terms for purpose of exploiting same and ensuring its full development and practical working in this country.—Address all communications in first instance to: Haseltine Lake & Co., Chartered Patent Agents, 28, Southampton Buildings, Chancery Lane, London, W.C.2. 259

THE Proprietor of Letters Patent No. 123,767, relating to "Improvements in Electric Motor Cars," desires to dispose of the Patent or to grant Licences to interested parties at reasonable terms with a view to the adequate working of the Patent in Great Britain.—Inquiries to be addressed to Svenska Elektrobil Aktiebolaget, Rosenlundsgatan 29, Stockholm, Sweden. 285

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THE ELECTRICAL REVIEW,

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4, LUDGATE HILL, LONDON, E.C. 4.
Telegraphic Address: "Agenkay, Cent., London." A B C Code.
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Advantages include :—

Long and bold scale.

Accuracy unaffected by variations of temperature or of voltage over wide limits.

Switchboard Instruments are self-contained, external resistances and reactances are dispensed with.

Made also in circular 8 in. dial case.

Can also be supplied in the Recording Type.

The instrument illustrated is the 12 ins. scale, Sector Pattern N.C.S. Deflectional Frequency Meter. This has a long and bold scale, and its accuracy is unaffected by variations of temperatu e or of voltage over wide limits.

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Telephone: Clissold 2365 (3 lines). *Telegrams: "Occlude, Kinland, London."* *Codes: Western Union (Universal & Five Letter Ed.) and B.E.A.M.A.*

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is directly affected by the purity of its working medium—

The WEIR De-aeration Closed Feed and Heat Regeneration System

is scientifically sound; its units are well made, efficient, and reliable; its results are reflected in improved performance and saving in maintenance and attention.

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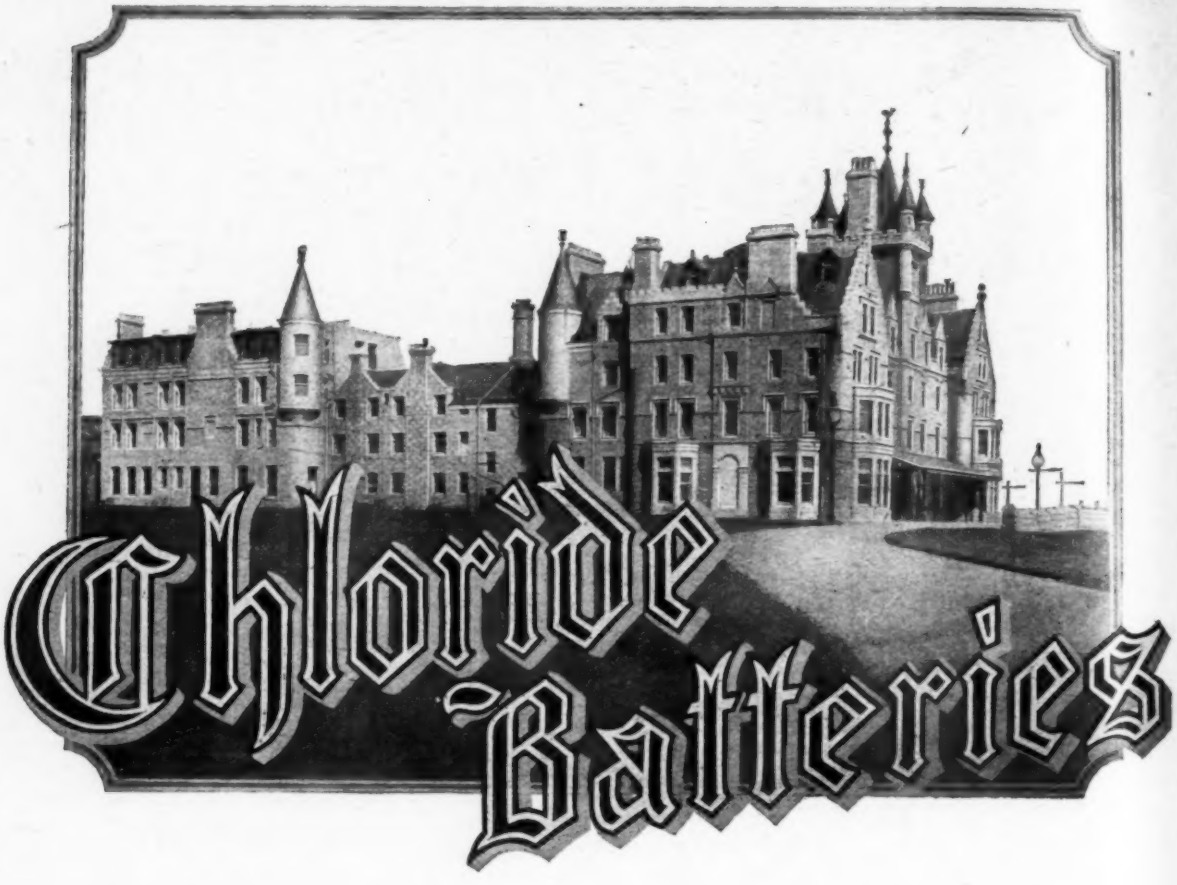

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As at Gleneagles and Turnberry, a Chloride battery provides current at Cruden Bay for lighting, heating and other modern uses of electricity.

There are Chloride batteries at very many country houses, in telephone exchanges, and large central power stations—unheard of, because they do their work quietly, efficiently, and away from the public gaze.

THE LARGEST BATTERY WORKS IN THE BRITISH EMPIRE.

USE EXIDE BATTERIES FOR THE CAR AND WIRELESS.

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The B.I. are able to announce a new manufacturing process, provisionally protected by them, which will ensure to armoured cables a far greater protection from corrosive action, due to the nature of the ground in which the cables are laid, than has hitherto been achieved.

Briefly stated, the process makes possible the application of a greatly increased thickness of waterproofing compound between the sheath and the armour, without any fear of decentralization under heat.

The fullest particulars will be sent on application to—

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Cable Makers and Electrical Engineers,

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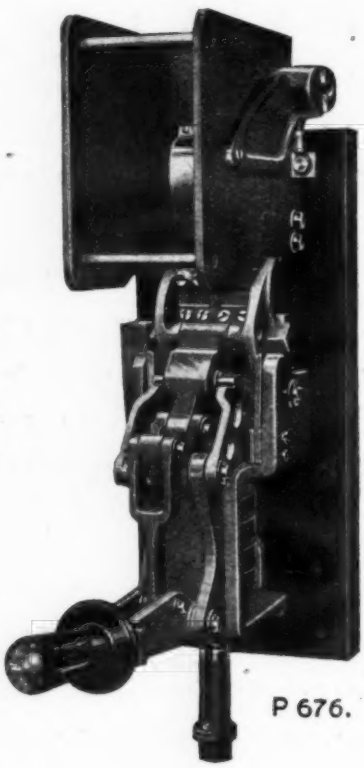
You have the impression that our **CIRCUIT BREAKERS,** Knife Switches, and "Cool Handle" Porcelain Fuses, admittedly of the highest class, are too expensive for the average job, you will be well advised to write **NOW** for our latest **REDUCED PRICES.**

A typical D.C. Breaker is shown, the features of which are: Massive Toggle Movement, with complete absence of delicate parts.



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Non-rusting Axles.

Magnetic blowout and carbon break, with ample arc shields.

Very rapid break.

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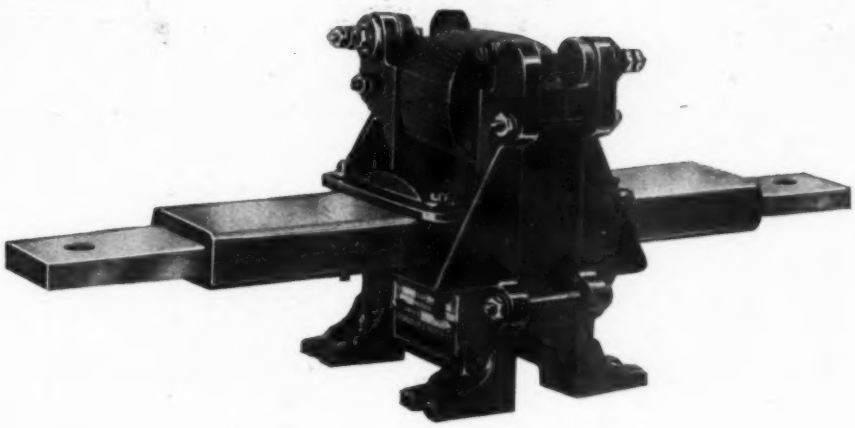

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For certain purposes it is desirable to have a Series Transformer insulated for comparatively high pressures, but of the open type and air cooled. For these purposes Chamberlain and Hookham, Ltd., have designed the Tube Type of Transformer.

The Primary winding is enclosed, all except the ends, in a long rectangular tube of bakelite material, which extends a considerable distance beyond the secondary winding and core.

Transformers of this type are made with a single turn primary, or with a multi-turn primary. They are made in two sizes, one insulated up to 7,000 volts, and the other up to 12,000 volts.

The mechanical construction of these Transformers is especially robust to withstand the very severe strains sometimes occurring due to short circuits.

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PUSH BAR SWITCH LAMP HOLDER.

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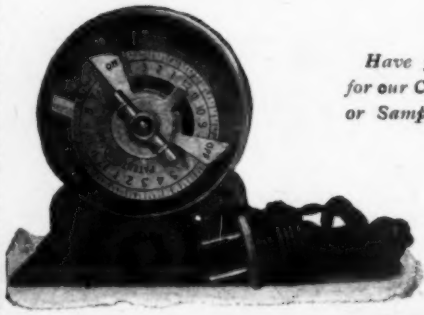

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No matter how small or difficult the proposition may be, it will receive exhaustive study with a view to satisfying, to the minutest details, your demands.

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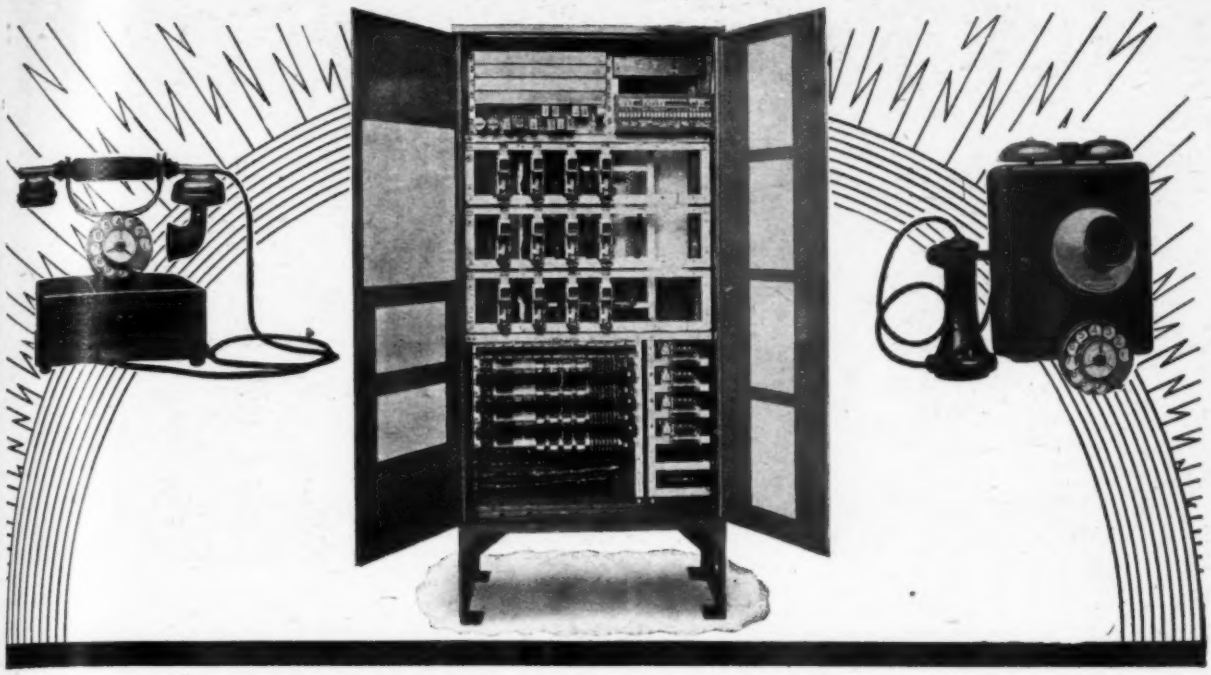

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SOME means of rapid intercommunication between offices, rooms, and various buildings is essential to every business, and whilst efficient central-battery pattern intercommunication telephone sets are obtainable giving satisfactory service when properly installed, such systems, being limited to a maximum of approximately 25 stations, bring the initial outlay beyond that at which an equally serviceable Automatic System can be supplied.

The Western Electric No. 47001 Automatic System is designed for a maximum capacity of 35 or 70 lines and can be equipped for any number of lines from 15 to 70.

Absolute secrecy is at all times desirable, yet seldom obtainable by the ordinary telephone method, whereas, with the No. 47001 Automatic System this all-important feature is provided. For this reason alone this System is to be preferred even for quite small installations of from 10 to 35 lines.

The whole of the equipment, excepting batteries and power panel, is assembled on an upright iron frame enclosed within a sheet-iron cabinet, and is not only compact, but occupies very little floor space.

The telephone sets for use with this equipment are of the C.B. type, but Wall or Desk pattern sets may be used, which can be of the hand-microtelephone type, if desired.

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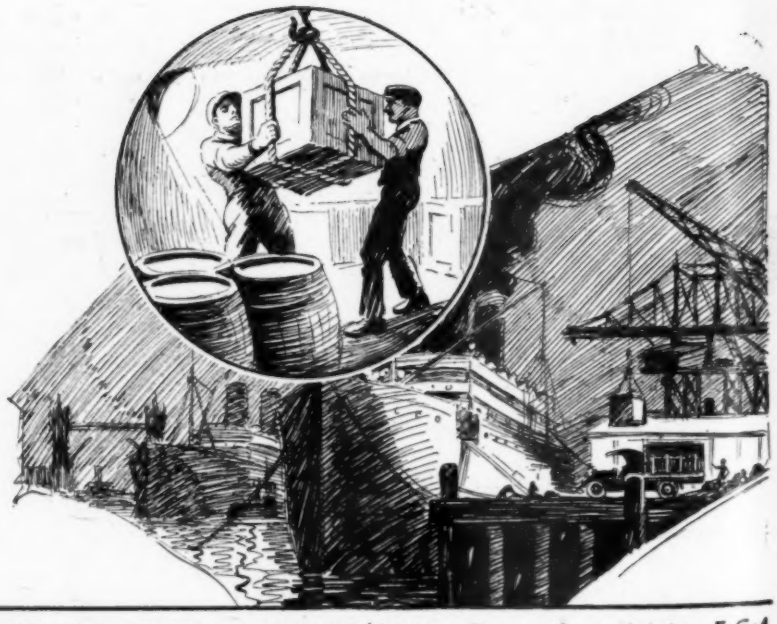
This form of lighting calls for special knowledge and experience and our Illuminating Engineering Department will welcome the opportunity of co-operating with you in any lighting scheme.



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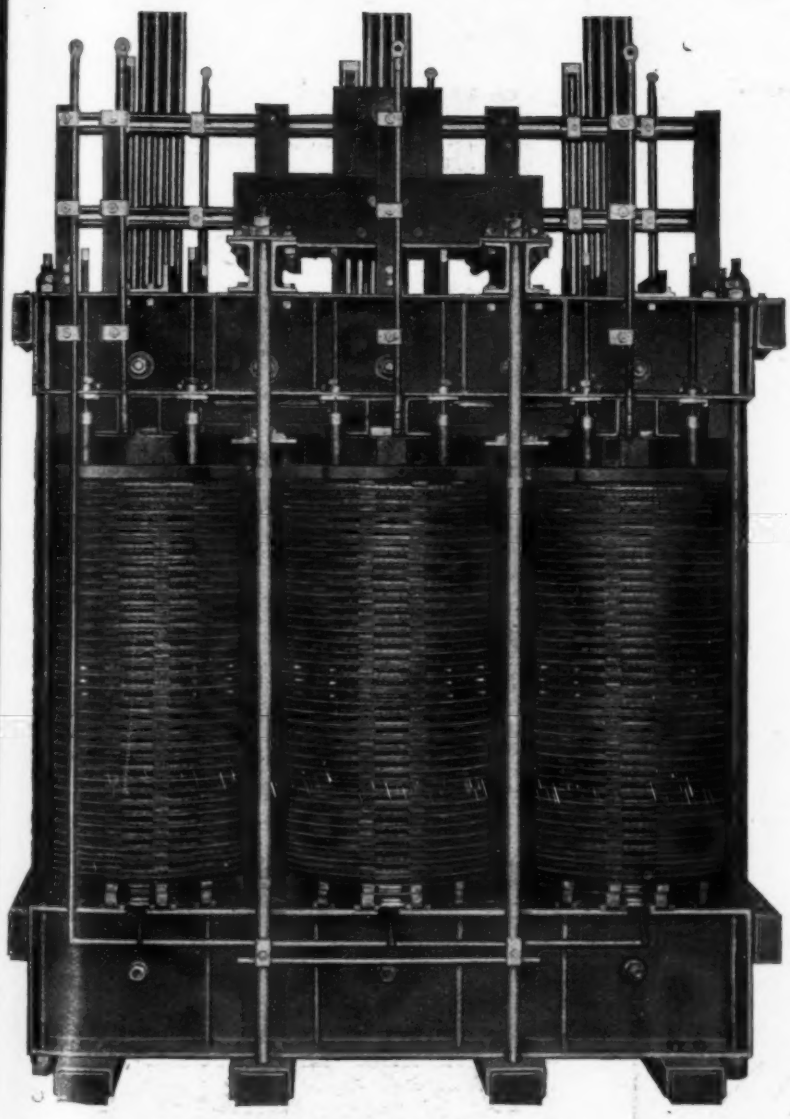

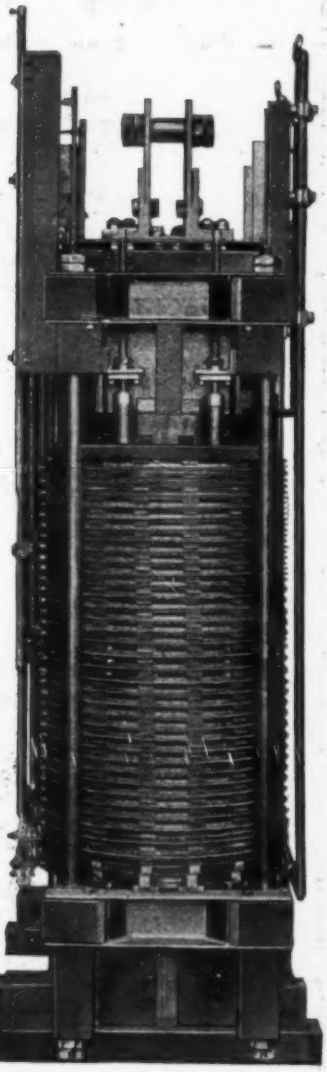

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The Hand-Lamp with All the Advantages.

For real heavy knock-about usage and efficient service there is not a Lamp on the market that in any way can compare with

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20 hours' brilliant light on one charge.

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Patents applied for.

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THE positive washing action under high pressure eliminates microscopic Fibres.

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The internal cones may be assembled promiscuously without throwing the Drum out of balance.

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The provision of an extra set of cones (costing in the case of the largest purifier only **£5 5 0**) will enable stops for cleaning to be reduced to a minimum, and is practically equivalent to a spare Drum.

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No other machine combines these advantages, added to which the "Empson" is

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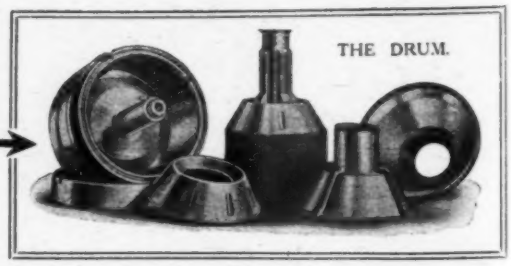

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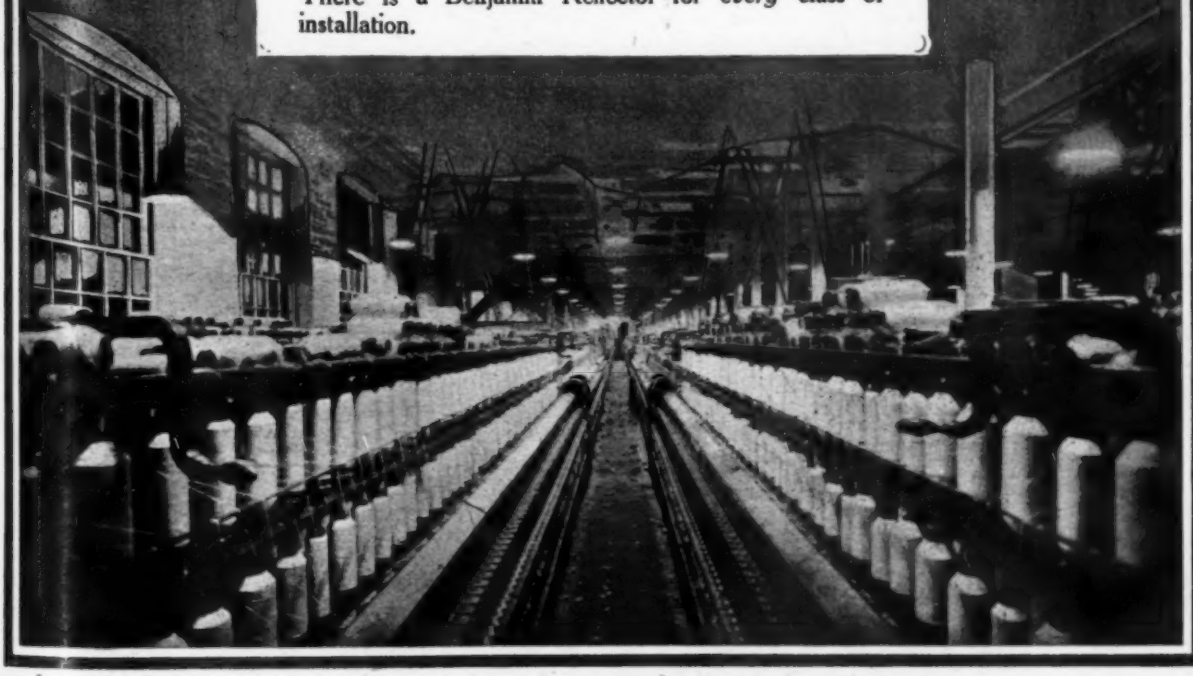

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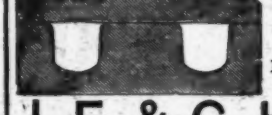

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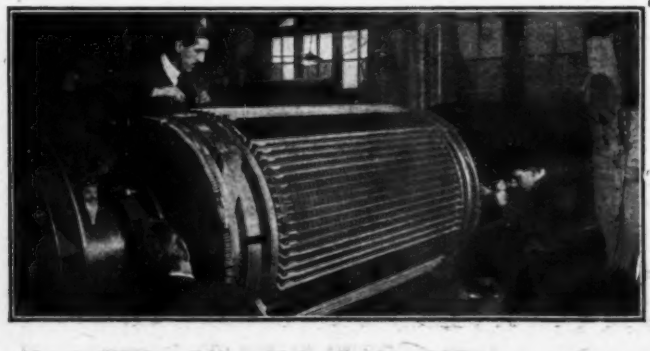

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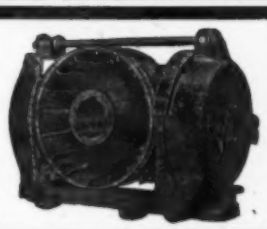

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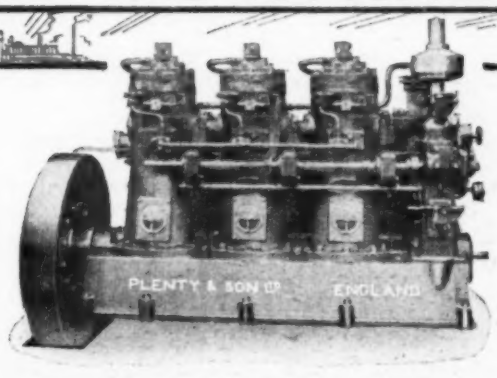

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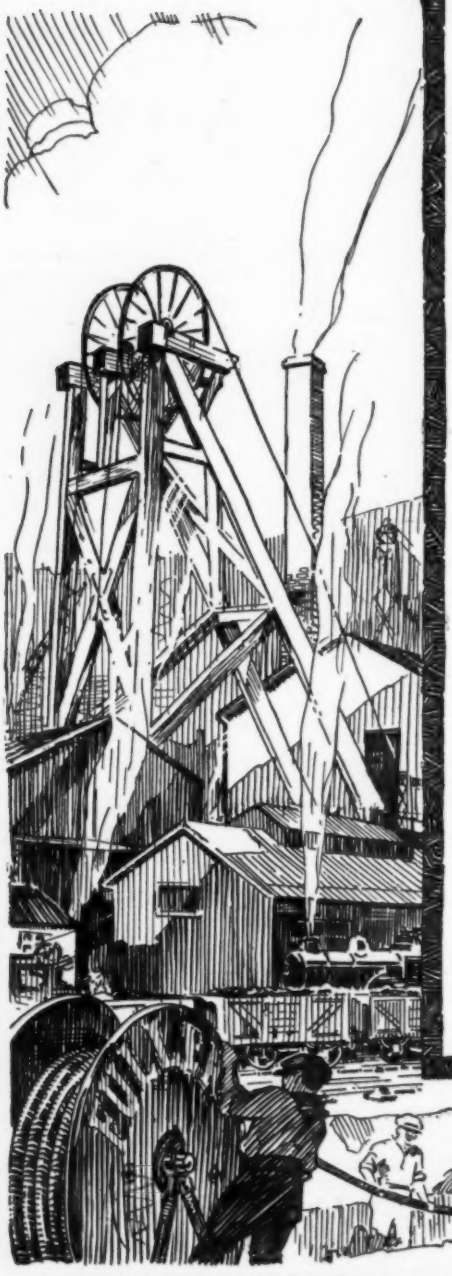

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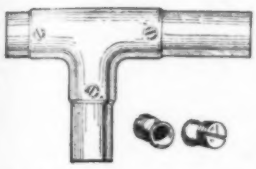

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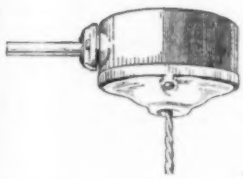

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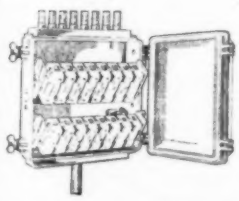

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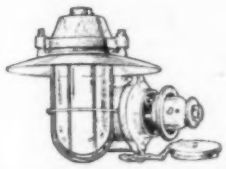

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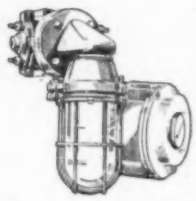

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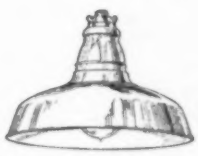

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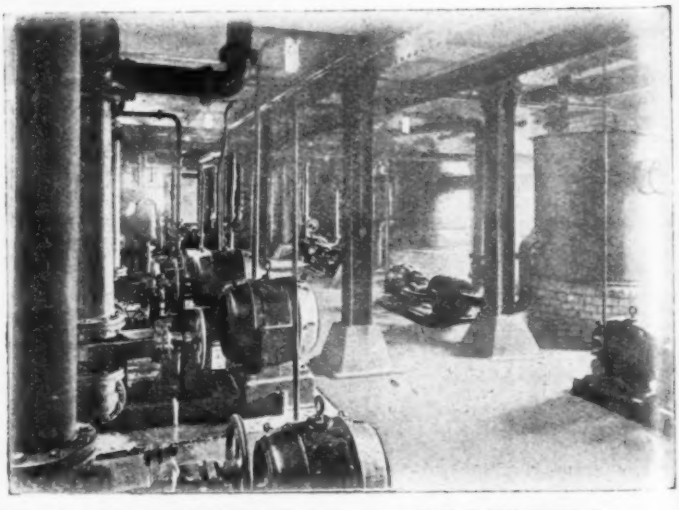

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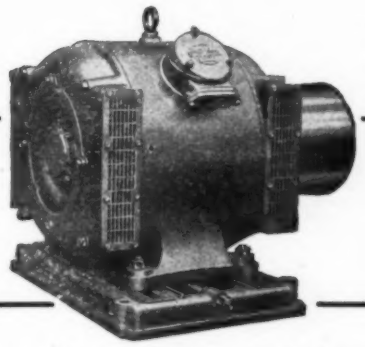

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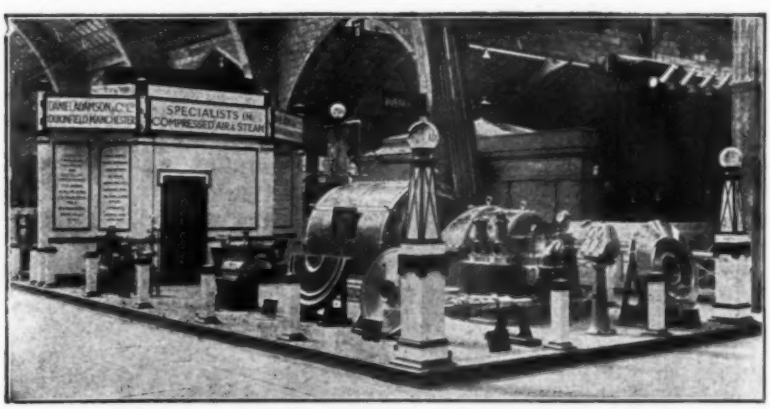

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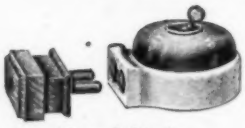

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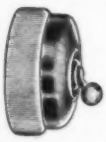

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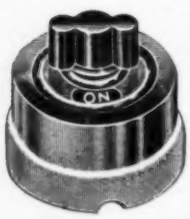

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„ 252	...	5 „	2-way.
„ 253	...	10 „	S.P.
„ 254	...	10 „	D.P.
No. 255, 5-Amp. D.P.			with plug.
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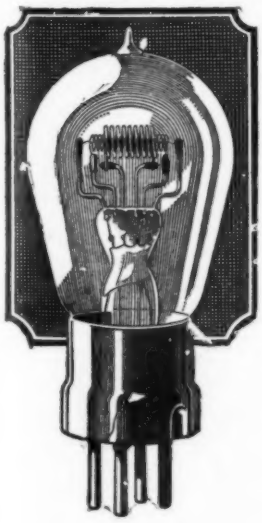

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It only takes 0·4 Amps. in the filament and therefore uses half the current of the ordinary bright emitting valve.

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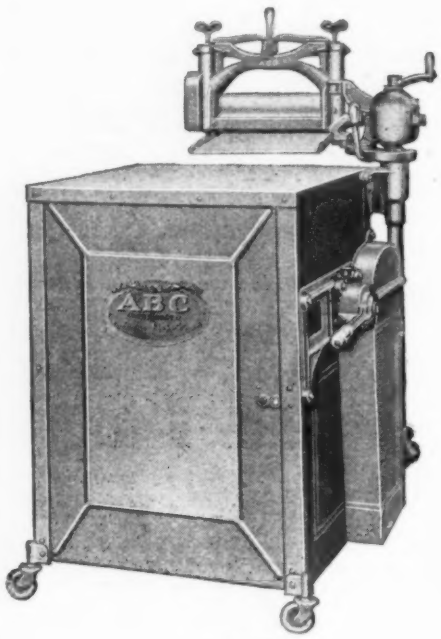

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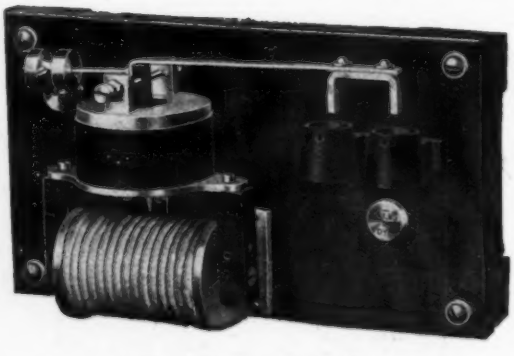

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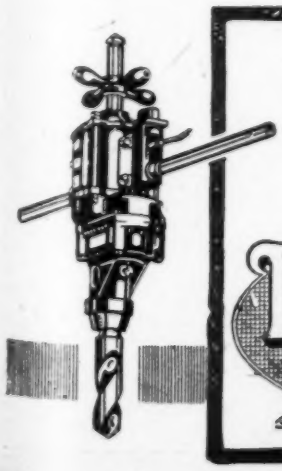

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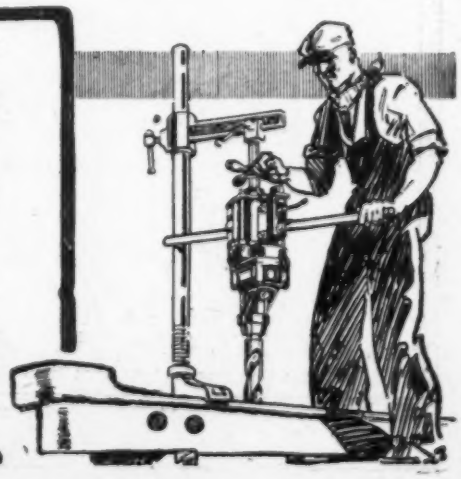

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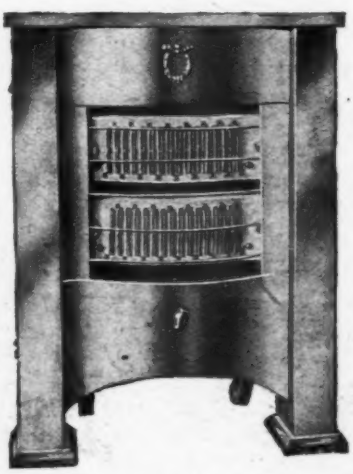

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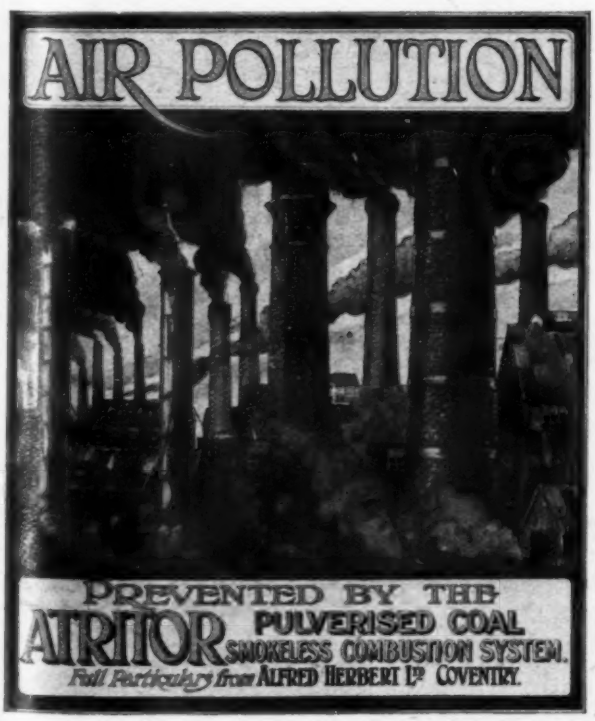

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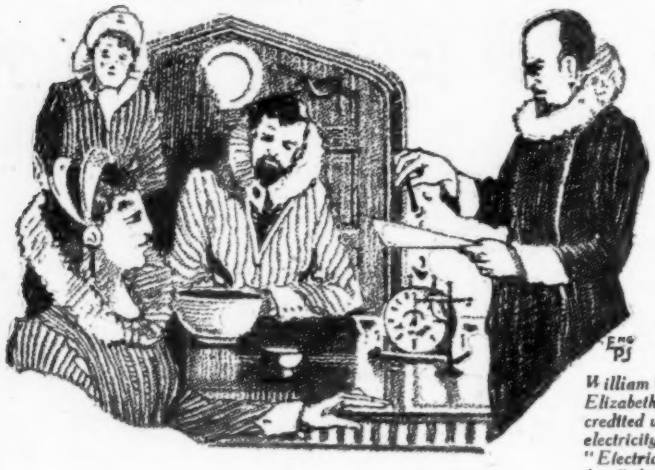

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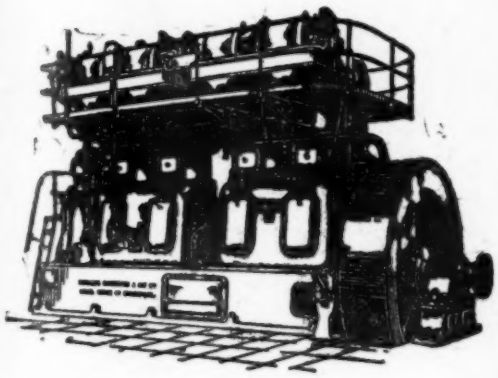

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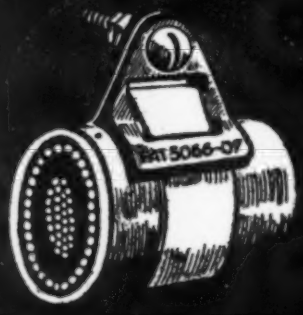

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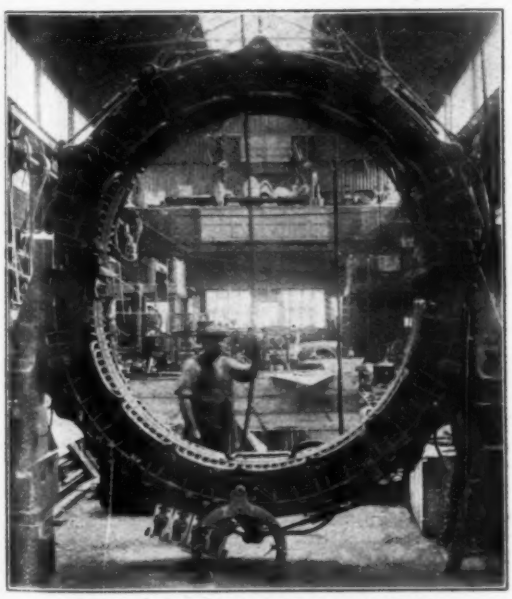

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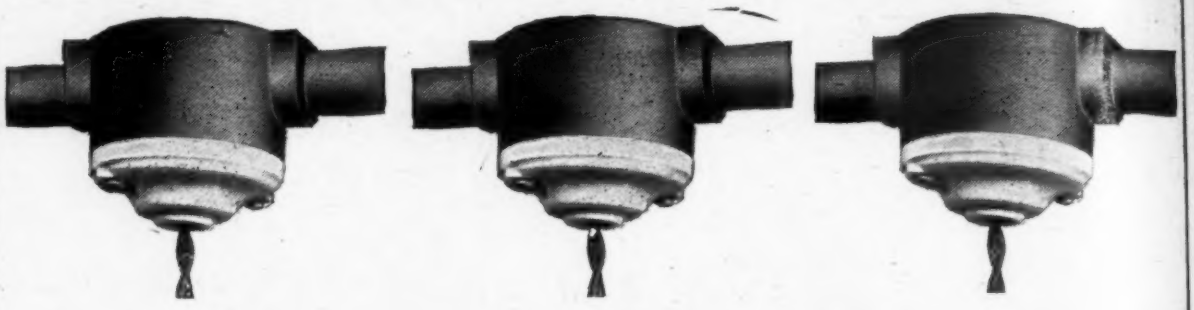

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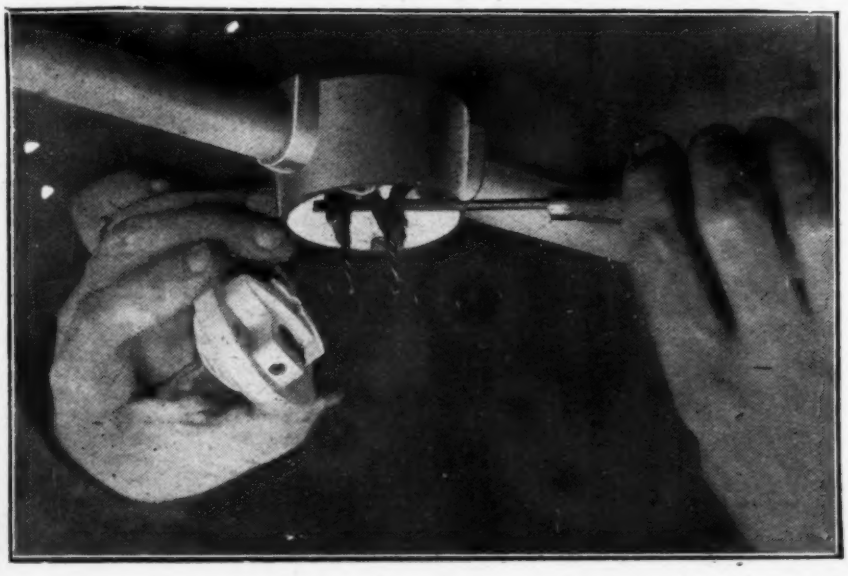

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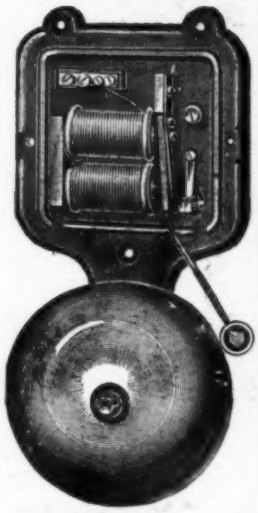

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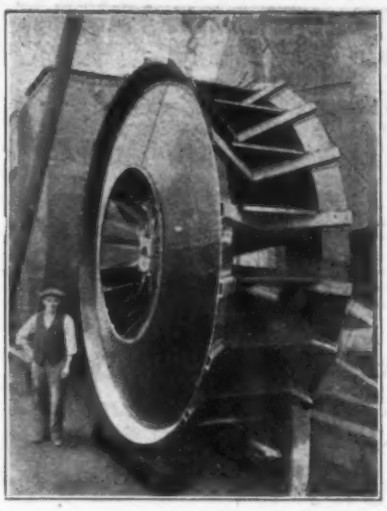

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from flue gases, without Cyclones.

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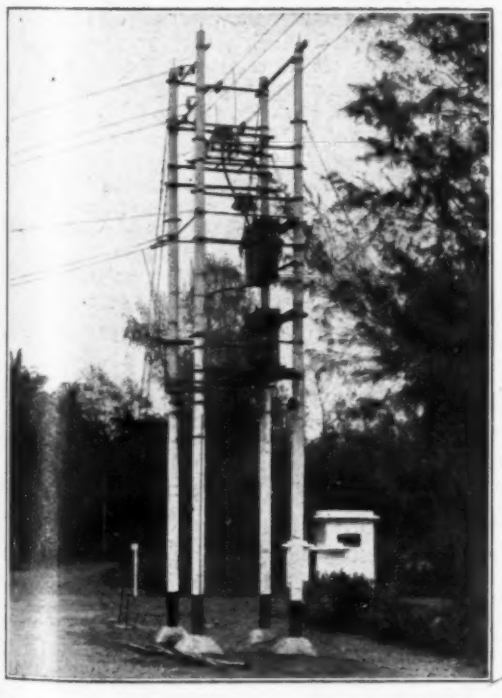

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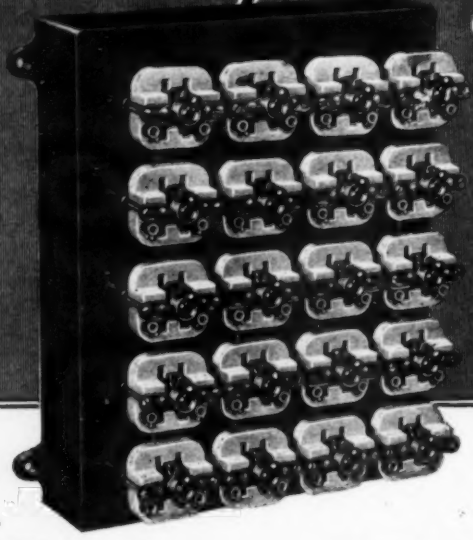

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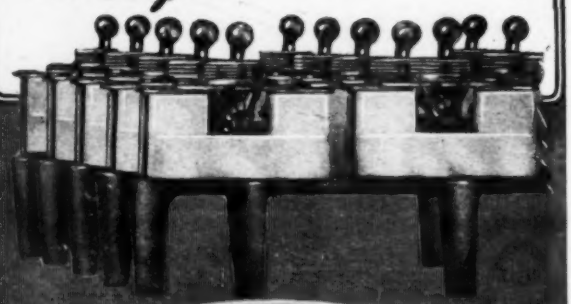

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"An infinite capacity for taking pains" is a virtue that has brought us, at all events, a very material reward. We are so flooded with orders for the TrueMusiC Minor that we are obliged temporarily to stop advertising it—a striking testimony both to the efficacy of our advertising and to the quality of our products.

At £6 10s. the TrueMusiC Concert Grand is amazingly cheap. Its tone and volume are both unequalled, and for the wireless amateur who wants a good loud speaker that will really give unqualified results for family and general use it has no equal. It is a really high-class instrument, and the highest of its class. Its height is 30¼ in., diam. of bell 15¼ in., and resistance 4,000 ohms.

T.M.C. No. 3 Lightweight Headphones weigh only 6½ ounces. Ventilated ear-caps, balanced magnetic circuits, connections of an adequate and comfortable length, all show that attention to detail, that "infinite capacity for taking pains," which characterises all T.M.C. products. The price is only 22/6.

Send for our parcel of sales literature, which gives full particulars of all T.M.C. products, &c.

LOUD SPEAKERS.

TrueMusiC Minor -	£1 1 0
TrueMusiC Junior -	£2 10 0
TrueMusiC Standard	£5 0 0
TrueMusiC Concert Grand	£6 10 0
T.M.C. No. 3 Lightweight Headphones -	22/6

TMC

The TELEPHONE MANUFACTURING Co., Ltd.,
Hollingsworth Works, West Dulwich, S.E. 21.

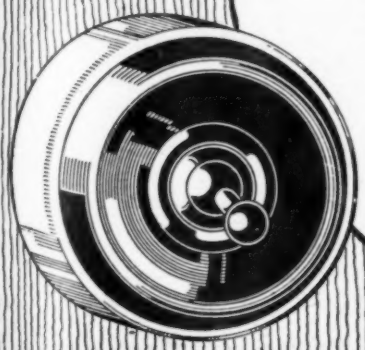
E.P.S.233

Wandsworth

(Registered Trade Mark).

The 16-year old Switch that has sold in millions!

The Wandsworth range of Positive-action Switches is no newcomer in the Industry. For SIXTEEN YEARS it has enjoyed an unequalled popularity and success among those who appreciate its greater efficiency and higher quality. The remarkable number that have been sold during that period is PROOF POSITIVE that they give entire satisfaction time and time again.



No. 4 one-way Switch, No. 8 two-way and No. 28 15-amps.
.....and prices are as keen as the quality is good!

The WANDSWORTH ELECTRICAL Mfg. Co., Ltd.
Ludgate Hill - - - - Birmingham.
LONDON: Primrose House, 26, D'Arblay Street, Wardour Street, W.1.

SIMPLICITY AND RELIABILITY

"BROOK" Squirrel Cage Motors.

Up to 275 B.H.P.

The Motor of Unchallenged Simplicity.

The Squirrel Cage Induction Motor.

No Slip Rings, no insulation on revolving parts, therefore the most rugged machine possible to make.

Squirrel Cage Motors are more efficient, cheaper, and less complicated than Slip Ring machines, and should be installed wherever possible.

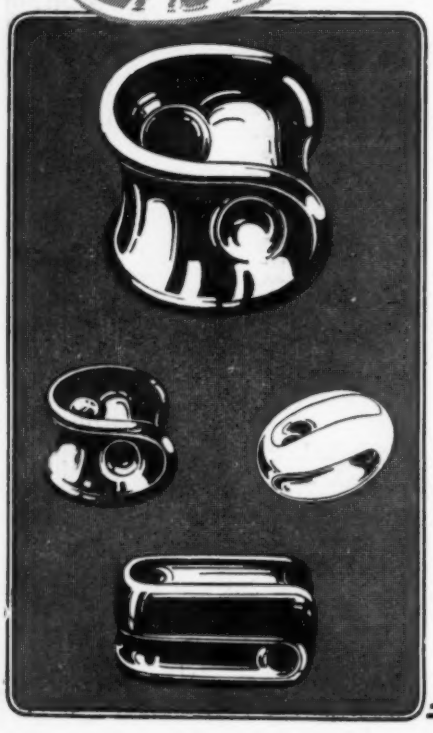
BRANCHES:
LONDON: 11, Queen Victoria St., E.C.4.
MANCHESTER: 54, Corporation St.
LEICESTER: 29, Bowling Green St.

E. BROOK, LTD.,
Empress Works, HUDDERSFIELD.

Telephones: 1629, 1630. Telegrams: "Phase, Huddersfield."

"Insulators of Quality"

for Wireless.



Prompt Deliveries of ALL Patterns!

Our special facilities for the production in large quantities of insulators of all types place us in a most favourable position for meeting all demands of the Trade for Wireless Insulation.

More—an experience of over 50 years in ALL insulation problems enables us to produce

Wireless Insulators superior in every way to anything else on the market—yet at a highly competitive price.

Mechanically and electrically perfect—proof against leakage, against the most severe tension stresses, our Insulators for Wireless have proved in actual use to be 100 per cent. efficient.

Supplied in White, Brown or Green Colours.

A Postcard will bring full particulars and prices of standard patterns ready for immediate despatch.

TAYLOR, TUNNICLIFF & Co., Ltd.

"INSULATORS OF QUALITY"

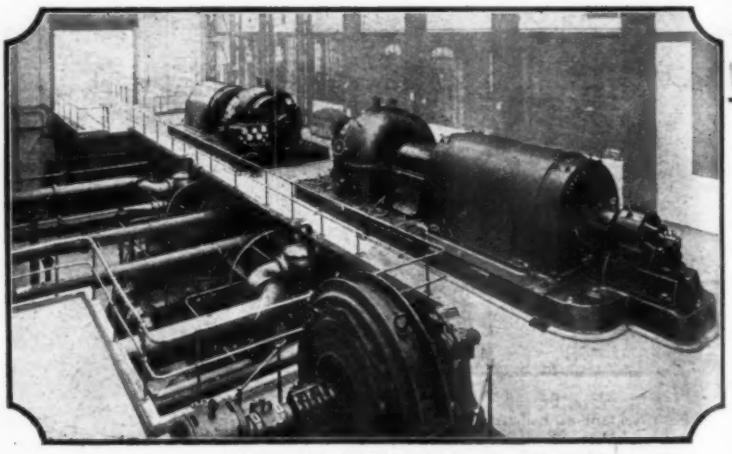
Eastwood, Hanley, STAFFS.

LONDON:
110, Cannon Street, E.C.

GLASGOW:
74, York Street.

T & T ENGLAND

Parsons Alternators



Two 6,250 K.V.A., 6,600 volts, 50 cycles, 3,000 R.P.M. Parsons Alternators, installed in the Lydney Power Station of the West Gloucester Power Company.

for coupling to

ALL TYPES OF PRIME MOVERS:—

Steam and Water Turbines,
Reciprocating Steam Engines,
Oil Engines, &c.

Permit us to quote for all your generating plant whether high or low speed.

C.A. PARSONS

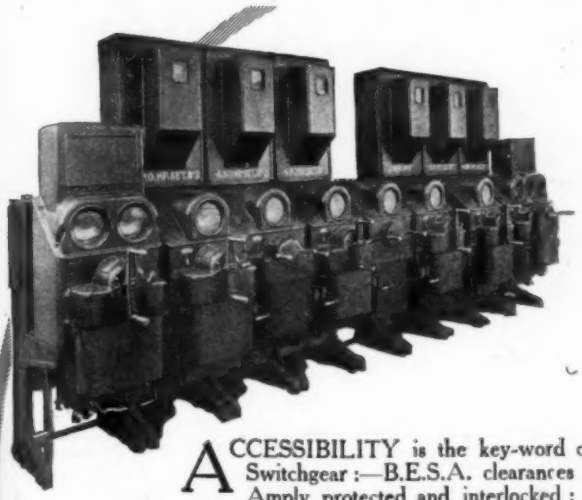
Heaton Works, Newcastle-on-Tyne.

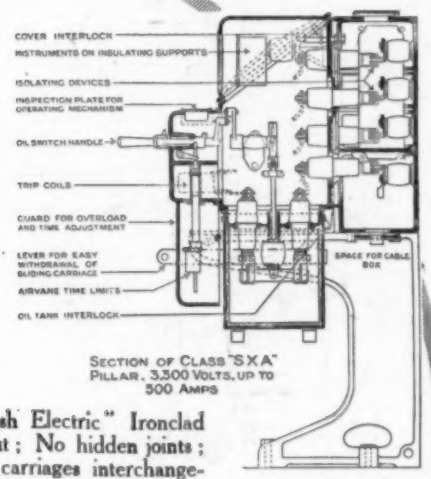
& COMPANY LTD

London Office: 56, Victoria St., London, S.W.1.

I.P.S. No. 54—P.1789.

"English Electric"
ACCESSIBLE IRONCLAD
DRAW-OUT TYPE
SWITCHGEAR

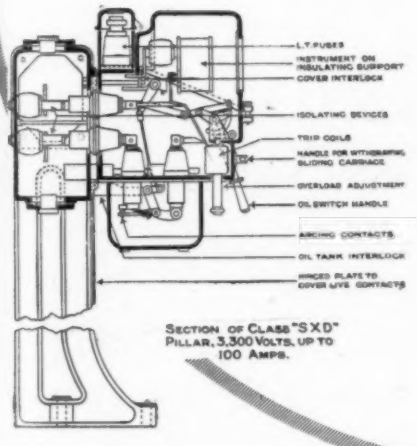




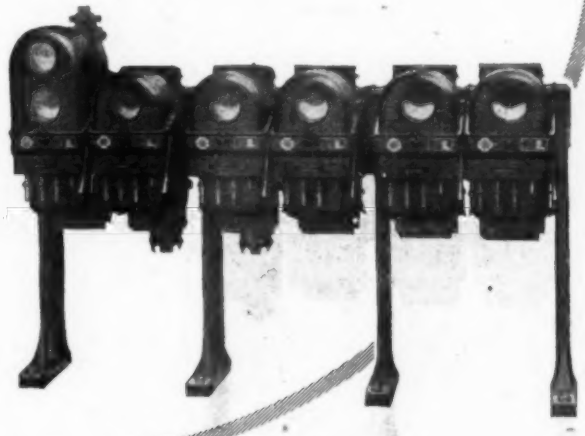
SECTION OF CLASS "SXA" PILLAR, 3,300 VOLTS, UP TO 500 AMPS

ACCESSIBILITY is the key-word of "English Electric" Ironclad Switchgear:—B.E.S.A. clearances throughout; No hidden joints; Amply protected and interlocked: Sliding carriages interchangeable; Switchboards easily assembled; Small floor space. The Class S.X.D. Pillars are for industrial use on small systems.

Write for Price Lists 2110 and 2111.



SECTION OF CLASS "SXD" PILLAR, 3,300 VOLTS, UP TO 100 AMPS.



SWITCHGEAR ADVT. SERIES, No 2.

The
ENGLISH ELECTRIC
Company Limited.

WORKS:- BRADFORD, COVENTRY, PRESTON, RUGBY, STAFFORD.
HEAD OFFICE:-
Queen's House, Kingsway, London, W.C.2.

FERRANTI

WHAT IS A CHEAP METER?

D.C.

A.C.

The price is not the only factor, or even a main factor, because the cost of using a doubtful meter is much greater than its purchase price.

The *value* of the electricity measured over the period of meter life makes the purchase price a small percentage.

The main features are—

COST OF MAINTENANCE.

COMPLETE RECORD OF ALL CURRENT.

CONFIDENCE OF THE CONSUMER IN JUST SCALES.

HOLLINWOOD,
LANCASHIRE,
ENGLAND.

THE
FERRANTI METER
IS A
JUST METER.

The only Contacts those you want

Combined Busbars & Terminals.

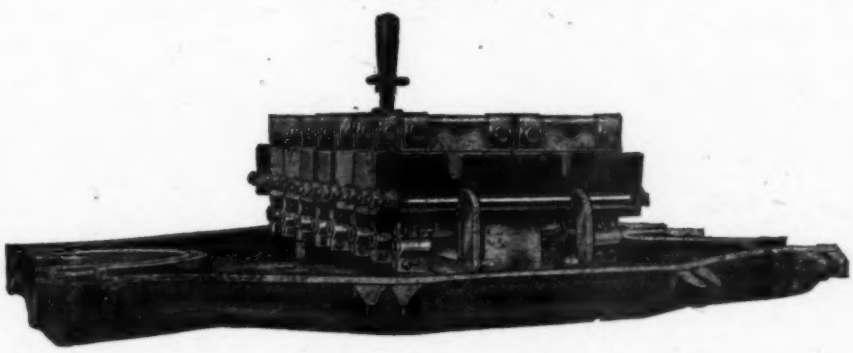
Combined busbars and terminals without joints of any description cut down the number of contacts to a minimum. All busbars, Links and Terminal Pillars are made from continuous lengths of high conductivity hard rolled copper giving 100% better conductivity and no blow-holes. Another feature :—Coloured Porcelain Insulators to identify poles and phases.

HENLEY

Underground Network Boxes

with Coloured Porcelain Insulators.

(Pat. No. 205742.)



Interior view of Four way Link Disconnecting Box showing Insulators mounted on rods passing through an iron framework which is bolted to bottom of C.I. Shell.

B1.

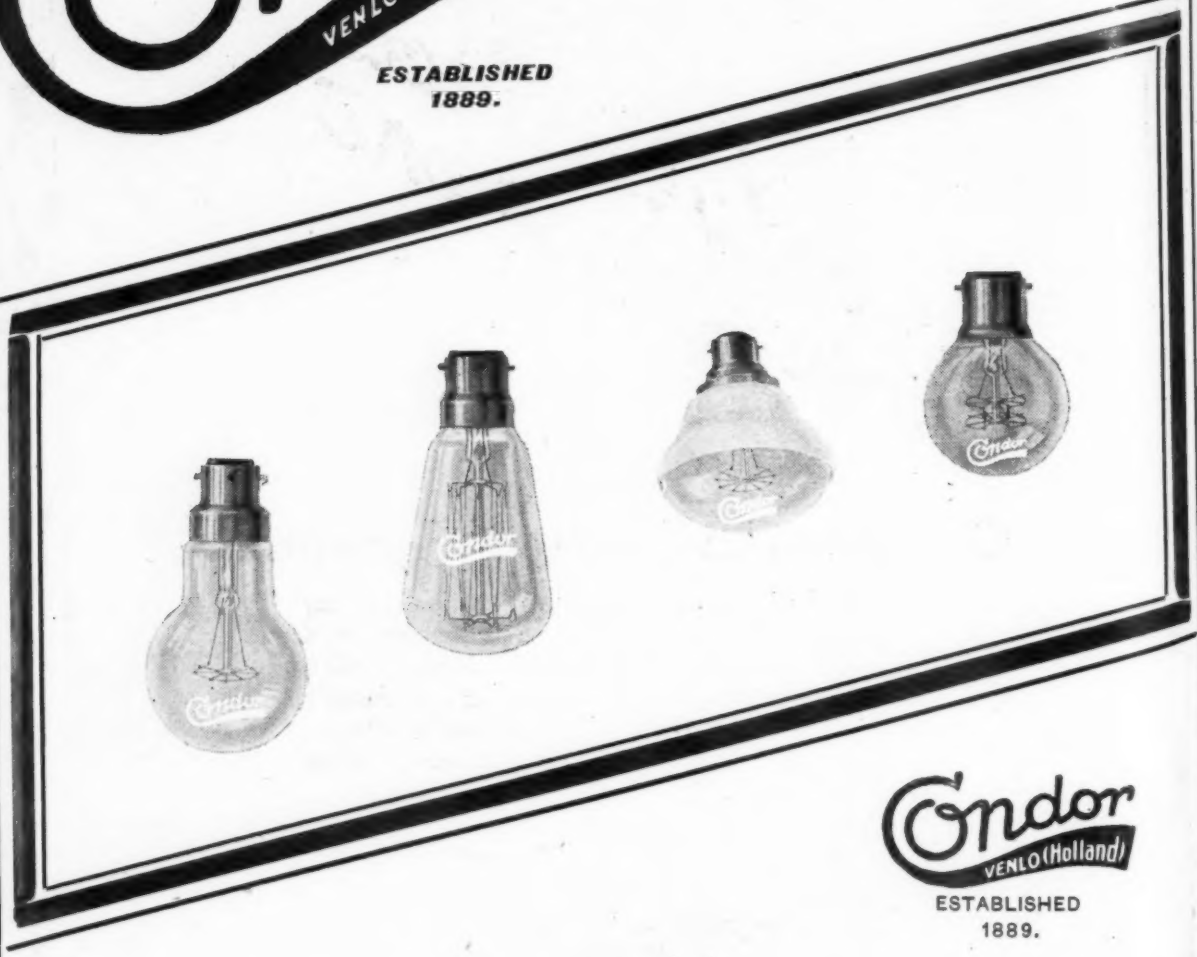
TRADE MARK

W T HENLEY'S TELEGRAPH WORKS CO. LTD. BLOMFIELD STREET, LONDON, E.C.

Condor VENLO (HOLLAND)

ESTABLISHED 1889.

THE BEST OF ALL.



Condor VENLO (Holland)
ESTABLISHED 1889.

YOU CANNOT BUY A BETTER LAMP

BETTER LIGHTING

HIGHEST QUALITY OBTAINABLE

LOWER COST

HEAD OFFICE

CONDOR LAMPS (GREAT BRITAIN) LTD.,

60, WILSON STREET, FINSBURY SQUARE, LONDON, E.C.2.

TELEPHONE: LONDON WALL 696.
TELEGRAMS: "CONDORLITE, FINSQUARE, LONDON."

Your First Letter for 1925

SIEMENS BROTHERS & Co. Ltd.

General Offices & Works

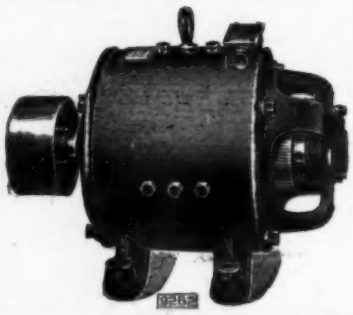
WOOLWICH, LONDON, S.E.18.

Telegrams: Siemens, Woolwich. Telephone: City, 6400, (7 lines).

Registered Offices:- CAXTON HOUSE, WESTMINSTER, S.W.1.

Telegrams: Siemens, Vic, London. Telephone: Vic. 9390 (5 lines).

Dynamos and Motors of Merit.



The outstanding features of "RANSOME" continuous current Dynamos and Motors include sturdy construction, up-to-date design and good finish. They comply fully with British Standard Specification No. 168/1923.

"RANSOME" Motors are built to give good service and ensure satisfaction to the user.

RANSOMES, SIMS & JEFFERIES, Ltd., *ORWELL WORKS, IPSWICH.*

London Office: **46, Queen Victoria Street, LONDON, E.C.4.**

"MADDICK" *Superlock* Washer

BRITISH PATENT NUMBER 174937

THE ordinary nut—the commercially produced article, is quite capable of performing its functions—so long as it remains tight. The "Maddick Superlock Washer" insures that nuts stay tight no matter how much vibration is present.

The Superlock is the one nut-lock device which all engineers will approve of. It is cheaper, it requires no special tools, it is fitted in a few seconds, and it cannot be assembled wrongly. As it screws on *after* the nut, perfect seating is assured, and there is no need to disturb adjustments. Once locked it stays locked, yet does not interfere with dismantling. It can be used over and over again.

Let us send you a sample selection for trial.

Honeywill Brothers, Ltd.

(Engineering Department),

79, Mark Lane, London, E.C.3.

The Washer Which Locks & *Stays* Locked

RECEIVER'S SALE OF THE CELEBRATED

A. & A. MOTORS.

ALL 1/8 H.P. UNIVERSAL, in Aluminium or Black, in the following types:—

110 Volts, 1,800 r.p.m.	220 Volts, 3,500 r.p.m.
110 „ 3,500 „	200/250 „ 1,800 „

Also a few 110 Volts, D.C., FIDELITY MOTORS in 1/16, 1/12, 1/8 and 1/6 H.P.

All at £3 15s. Od. each, net cash.

Apply: THE RECEIVER,

A. & A. ELECTRICAL CO., LTD.,

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IF YOU want to feel confident that your HEATING ELEMENTS will not fail, use

"RAYO"

NICKELCHROME WIRE

in their construction.

Large stock of all usual sizes kept in LONDON for instant despatch by

OLIVER PELL CONTROL, LTD.,

Granville House, Arundel Street,

Telephone: CITY 3393. **LONDON, W.C. 2.**

H.

EBONITE

OF ALL STANDARD QUALITIES AND TO ALL USUAL SPECIFICATIONS.

SEPARATORS, BOXES & FITTINGS FOR ACCUMULATORS OF ALL TYPES.

PUMPS, TAPS, PIPES, &c., for CHEMICAL ENGINEERING.

SOLID EBONITE HORNS FOR LOUD SPEAKERS. The non-resonant properties of Ebonite is now being fully recognised by wireless manufacturers and the demand for these to replace metal and similar horns is rapidly extending. We have the ***experience of years*** behind us in this specialised branch and would be glad to place same at your disposal. **Let us send you our illustrated list.**

EBONITE FOR ALL WIRELESS PURPOSES.

100% EBONITE ONLY.

EBONITE FOR ALL ELECTRICAL INSULATION.

WHOLESALE ONLY. SEND US YOUR ENQUIRIES OR WRITE FOR LIST.

HIGHTENSITE & EBONITE MFG. Co., Ltd.,

'Phone: EAST 3153. NORMANDY WORKS, CUSTOM HOUSE, LONDON, E. 16.

E.

Electromotors Limited
OPENSHAW
MANCHESTER.

MANUFACTURERS OF HIGH CLASS
TWO AND THREE-PHASE
INDUCTION
MOTORS

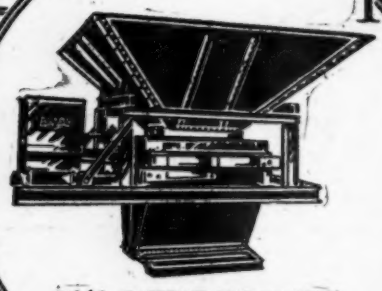
Delivery from stock of all standard sizes and speeds, Squirrel Cage or Wound Rotor.

Quick deliveries for special windings.

May we have your next enquiry?

AVERY

PRACTICAL ECONOMY



No 65 PATENT AUTOMATIC HOPPER WEIGHER & TOTALISER.

MEANS JUDICIOUS EXPENDITURE AND THE ADOPTION OF LABOUR SAVING MACHINES, WHICH RAISE PLANT EFFICIENCY TO THE HIGHEST PLANE, WHILE MAINTAINING OUTPUT ON ECONOMICAL LINES.

AVERY PATENT AUTOMATIC WEIGHERS COMBINE MANY IMPORTANT FEATURES THAT ENSURE CONSISTENT ACCURACY WITH REDUCED LABOUR COSTS.

THE CONTINUITY OF ACTION AND ADAPTABILITY FOR RAPID AND ACCURATE WEIGHING SHOW THESE MACHINES TO BE ESSENTIAL IN ALL MODERN PLANTS.

AVERY MACHINES ARE FREQUENTLY IMITATED, BUT NEVER EQUALLED, FOR QUALITY, ACCURACY AND UTILITY.

WRITE TO-DAY FOR LIST 74 TO:—AUTOMATIC DEPT.

AD 839.

W. & T. AVERY LTD SOHO FOUNDRY, BIRMINGHAM

PEDESTALS

for mounting

ELECTRICAL INSTRUMENTS.

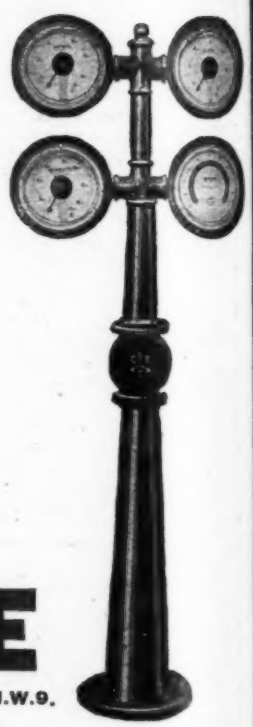
The Pedestals illustrated will meet practically every condition where instruments have to be mounted as a separate unit from the control gear or switchboard.

They are designed to stand on the engine-room floor or platform, special adaptors being provided for each type and size of instrument.

The pedestals and brackets are hollow to receive the connecting leads, which, if desired, are brought to a junction box with removable cover (shown on the right hand figure).

ANY NUMBER OF INSTRUMENTS CAN BE MOUNTED ON A SINGLE PEDESTAL.

By means of suitable extension pieces these pedestals can be of any desired height.



"SUPER-SCALE"
(Reg. Trade Mark)
Ammeters and Voltmeters
represent
"The Last Word in Instrument Design."

EVERETT EDGCUMBE

117, Victoria St., S.W.1. 'Phone: Victoria 3020. **LONDON & HENDON.** Collindale Works, N.W.9. Kingsbury 45.

MEGGER

"Your Instruments at this Institution show a splendid record."

MEGGER

EVERSHED & VIGNOLES,

LIMITED,

ACTON LANE WORKS,
CHISWICK, LONDON, W.4.

Your Reputation

In building your reputation it pays to remember that high quality materials are the best in the end. The so-called "cheap" varieties of cables and wires constitute a danger to your reputation and you should avoid them. By using only materials of proved reliability, you will get recommended as one who does high quality work, and you will prosper. Consider your own and your clients' interests and install always

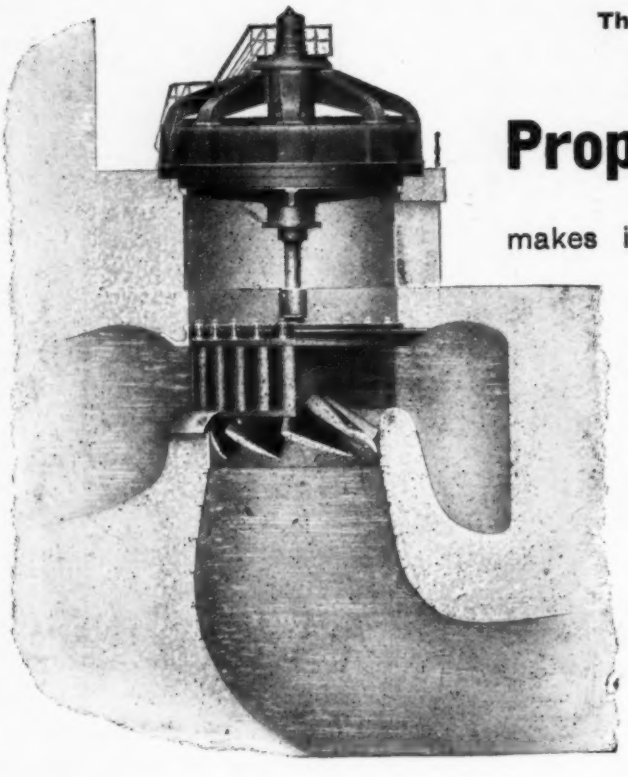
HENLEY

CABLES & WIRES

W. T. Henley's Telegraph Works Co., Limited,
Blomfield Street, LONDON, E.C.2.

Makers of Electric Cables since the beginning of Electrical Transmission.

WATER POWER



The

High Speed Propeller type RUNNER

(Lawaczeck's Patents)

makes it possible to use speeds about **100%** above that of the Francis turbine.

The illustration shows a large vertical shaft Turbine of the Lawaczeck type,

10,000 H.P.—20 ft. HEAD

JAMES GORDON

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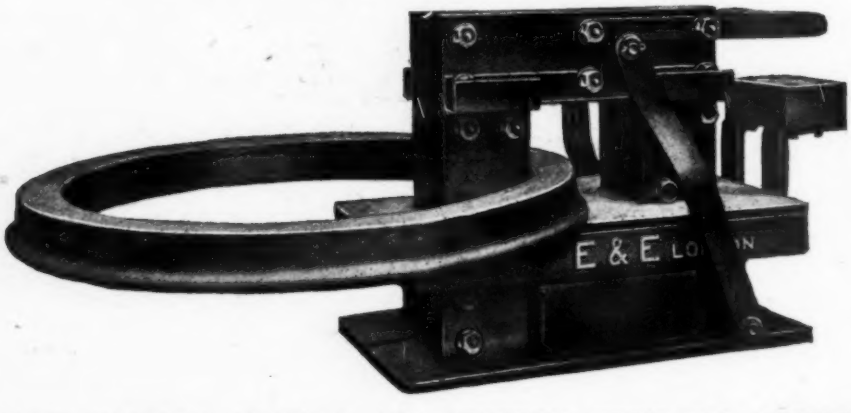
ELECTRIC TYRE HEATER

For Railways and Tramways.



ABSOLUTE UNIFORM HEATING AND FREEDOM FROM ALL DISTORTION.
RECOMMENDED BY ALL THE PRINCIPAL MAKERS OF HIGH TENSILE STEEL TYRES.
NO GAS FUMES OR SMOKE.
MORE ECONOMICAL AND QUICKER THAN GAS HEATING OR OTHER METHODS.
CAN ONLY BE OPERATED ON ALTERNATING CURRENT.
SUITABLE FOR TYRES UP TO 84" DIAMETER.

THE EQUIPMENT & ENGINEERING COMPANY,

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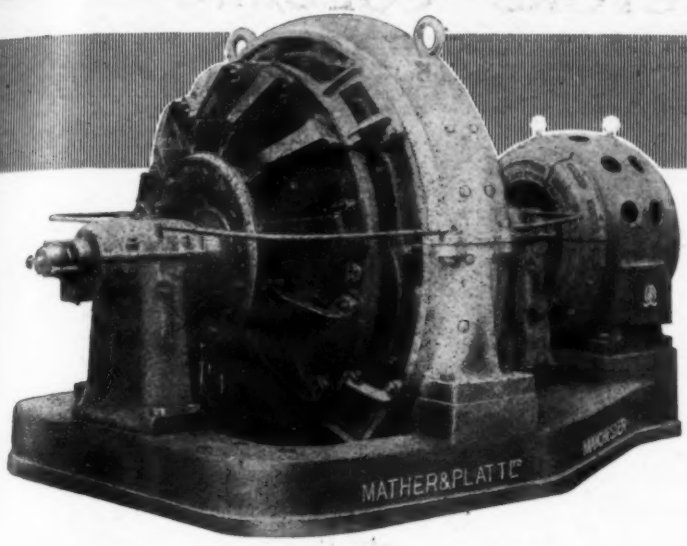
Cables: "KHARPARTS, LONDON." **Telephone:** CITY 1088 (2 lines). **Telegrams:** "KHARPARTS, ESTRAND, LONDON."



Self Synchronising ROTARY CONVERTERS

TO start a Rotary Converter of any size from rest, to synchronise with ease and certainty, and to have the machine in service in 30-40 seconds—that is the achievement of our Patent Starting and Self-Synchronising System for Rotary Converters. Details of the features which make this possible may be learned from Booklet E 143. May we send you a copy?

Some Users of "Mather & Platt" Rotary Converters:—

Manchester Corporation; Liverpool Corporation; Cardiff Corporation; Belfast Corporation; Colchester Corporation; Luton Corporation; Bath Corporation; Crewe Corporation; Darwen Corporation; Leeds Corporation; Kingston-upon-Hull Corporation; Barnes Urban District Council; North Metropolitan Electric Power Supply Company *and several other Supply Companies;* H.M. Office of Works; London, Midland & Scottish Railway Company; British Empire Exhibition (1924) Wembley; Blackpool Tower, *and many Collieries and other Industrial Concerns.* Many of the above authorities have placed repeat orders with us, e.g., Liverpool Corporation in March, 1924, for three 1500-kW and nine 1000-kW Rotaries.

Mather & Platt Ltd

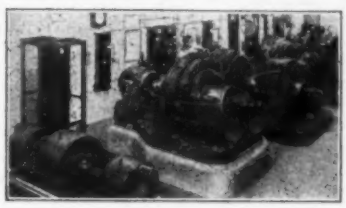
Electrical and Hydraulic Engineers.

PARK WORKS
MANCHESTER

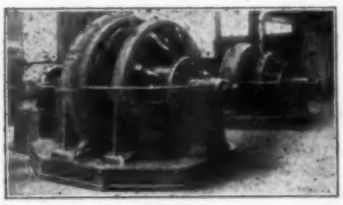
14, Gt. SMITH ST.
LONDON S.W.1

Why so many Public and Private Bodies are installing "Mather & Platt" ROTARY CONVERTERS

Because, in addition to the robust electrical and mechanical features always associated with Mather & Platt Machines, the Patent Starting and Self-Synchronising System is mistake-proof, certain and unique.



North Metropolitan Power Supply Co., Barnet. 500-kW Rotary Converter.

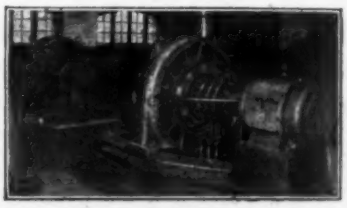


Manchester Corporation Electrical Dept. 1500- and 1000-kW Rotary Converters.

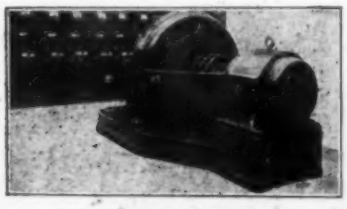
H.M. Office of Works, Sth. Kensington. 300-kW Rotary Converter.

Two 500-kW Rotary Converters at St. Albans.

500-kW Rotary Converter at Weston-super-Mare.



Two of 15 Rotary Converters supplied to Liverpool Corporation.



500-kW Rotary Converters for Barnes U.D.C.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ALLOA.—Housing scheme (36), for the T.C.; burgh surveyor.

BATH.—Housing scheme, Englishcombe Park (36), with shops, for the T.C.; A. J. Taylor, architect.

BIRMINGHAM.—Additions to Dudley Road Hospital; J. Curtis, clerk to Board of Guardians, Edmund Street.

BLACKBURN.—Additions to George Street West Mill, for exors. of R. R. Jackson. Extensions to Hart Street Works, for Jones (Textalities), Ltd.

BRIDGE OF ALLAN (Co. STIRLING).—Further housing scheme; burgh surveyor.

BRIERLEY HILL.—Church (£4,000), for trustees, Lower Gornal Methodist Church.

BROMLEY (KENT).—Club house, &c., for the Bromley Country Club, Ltd.; F. H. Wood, secretary, 185, Piccadilly, London, W.

BURTON-ON-TRENT.—High school for girls (£48,000); secretary to the Education Committee.

CAMBRIDGE.—Church (£3,850), for the trustees of Cherryhinton Congregational Church; Rev. J. F. Solomon, pastor.

COLWYN BAY.—Housing scheme (152), Tan Lan estate, for the U.D.C.; W. J. Dunning, surveyor.

DERBY.—Church, schools and vicarage, Cotton Lane district (£20,000); Rev. G. R. A. Hartley. Housing scheme (123), for the T.C.; C. A. Clews, borough surveyor.

DONINGTON (LINCS.).—Primitive Methodist Church at Pinchbeck West; Rev. G. Hall, superintendent of the circuit.

EASTLEIGH (HANTS.).—Municipal offices and public hall (£14,000), for the U.D.C.; T. Berry, architect, Guildford.

EDINBURGH.—Radiological department at Royal Infirmary (£40,000), electrical equipment (£12,000); the medical superintendent. Extension of department of surgery at University; Principal Sir Alfred Ewing.

EPSOM.—Additional housing scheme, for the U.D.C.; Crickmer & Foxley, architects.

EWELL (SURREY).—Houses (80), for Antill, Ltd.

FALKIRK.—Bookbinding factory, for Dunn & Wilson; the manager.

FERRY FRYSTON.—Schools (1,000 places), Airedale, for West Riding E.C.; F. A. Darwin, clerk, County Hall, Wakefield.

FIFESHIRE.—Miners' Institute at Dysart (£5,000); secretary, Institute Committee.

FOLKESTONE.—Housing scheme (80), for the T.C.; borough surveyor.

FORMBY (LANCS.).—Housing scheme, for the U.D.C.; S. J. Hellier, surveyor. Houses (20), for Barton Bros.

GLASGOW.—Ice rink (£50,000); Watson, Salmond & Gray, architects, West George Street. Extension to sundries department at Shieldhall, for Scottish Co-operative Wholesale Society (£70,000); Mr. R. Stewart, chairman of directors, Govan.

GRAVESEND.—Electric light installation, Sanatorium, for the T.C.; town clerk.

GREENOCK.—700 houses, for Corporation; burgh surveyor.

HADDINGTON.—Extensions at Western District Infectious Diseases Hospital (£12,000); Dr. G. Y. Richardson, county medical officer.

HARTLEPOOL.—Extensions to hospital, for the managers (£10,000); Captain Farmer.

HEMEL HEMPSTEAD (HERTS.).—Installing electric light, Town Hall and Council Chamber, for the T.C.; A. E. Usher, town clerk.

HINDLEY.—Housing scheme (36), for the U.D.C.; surveyor to U.D.C.

HULL.—Housing scheme (200), East Hull (£95,000); F. Bilton, builder, Hull.

HYTHE (KENT).—Additional housing scheme, for the T.C.; borough surveyor.

KINTYRE (CAMPBELLTOWN).—Re-erection of Southend Technical Schools; James Mason, headmaster.

KIRBYMOORSIDE (YORKS.).—Alterations to County Orthopædic Hospital (£14,000); secretary.

LITTLEBOROUGH.—Refuse destructor; surveyor to U.D.C.

LIVERPOOL.—Extension of Sacred Heart Roman Catholic schools (£20,000); rector. Factory extensions (£60,000), for Barker & Dobson, manufacturing confectioners.

LONDON, W.—Rebuilding Middlesex Hospital (£500,000), for the governors.

(BARKING, E.).—Schools, for the Roman Catholic school managers.

LONGTON (NEAR PRESTON).—Church at Hesketh-with-Becconsall (£4,000); Messrs. Thomas, builders, Lancaster.

MALDON (ESSEX).—Housing scheme, for the R.D.C.; W. Almond, surveyor, 6, Market Hill.

MANSFIELD.—Schools, Weatfield Lane, for the managers of St. Philip's Roman Catholic schools; Charles Payne, chairman, The Priest's House.

MARLOW (BUCKS.).—Re-erection of portion of Temple paper mills (electrically equipped), for Thomas Bros. & Co. (£6,000).

MARGATE.—Bathing pavilion, café, &c. (£28,490), for the T.C.; L. H. Snowden, contractor, Broadstairs.

MELKSHAM (WILTS.).—Additional 50 houses, Forest site, for the U.D.C.; W. W. Snailum, architect, Trowbridge.

NELSON (LANCS.).—School church, Walverden Road, for the Roman Catholic Church; Rev. Father Baron.

NEWPORT (ISLE OF WIGHT).—Housing scheme, Trafalgar estate, for the T.C.; borough surveyor.

NEWRY.—Housing scheme, Bailey Lane (Chapel Street) site (42), for U.D.C.; surveyor.

READING.—Housing scheme (30), Tilehurst, for the T.C.; borough surveyor.

REDCAR (YORKS.).—Housing scheme (100), for the T.C.; borough surveyor.

RENFREWSHIRE.—Electrical sub-station at Renfrewshire Combination Hospital; the superintendent.

RICHMOND (SURREY).—Extensions to Medina Works, Kew Green, for Dodge and Reid.

SALFORD.—Warehouses and transit sheds (£450,000), for the Ship Canal Co., Ltd.; H. A. Reed, chief engineer.

SEVENOAKS.—Housing scheme, for the U.D.C.; surveyor.

SHIPLAKE (HENLEY-ON-THAMES).—Memorial hall (£3,500); Mr. Marden, donor.

SHREWSBURY.—Housing scheme (70), Sultan Road, for the T.C.; borough surveyor. Church at Harlescot; Rev. J. E. Gordon Cartlidge, priest-in-charge.

STONEHOUSE (LANARKSHIRE).—Operating theatre and X-ray block, County Sanatorium, for the C.C.; W. E. Whyte, district clerk, Hamilton.

STOURBRIDGE.—Girls' secondary schools and extensions to grammar schools, for Worcestershire E.C.; the clerk, Worcester.

STRATFORD-ON-AVON.—Housing scheme (40), for the T.C.; borough surveyor.

SURREY.—Schools at Mitcham (£34,000), Malden (£21,000), Walton-on-Thames (£43,000), Reigate (£33,250), Epsom, £38,000), Kingston-on-Thames (£38,000), Sutton (£38,000), Oxted (£23,750), Wimbledon (£17,500), for the E.C.; W. W. Finny, secretary, Kingston-on-Thames.

SWADLINCOTE.—Housing scheme (50), for the U.D.C.; surveyor.

SWALLOWFIELD.—Schools, for Berkshire E.C.; W. C. F. Anderson, secretary, Shire Hall, Reading.

THURCROFT.—Houses (50), for Rotherham R.D.C.; J. E. Knight, architect, Regent House, Moorgate Street, Rotherham.

TILBURY (ESSEX).—Hospital extensions, for the Governors of Tilbury Hospital; Collcutt & Hamp, architects, Wigmore Street, London, W. Houses (43); Brown Bros., Ltd., builders, Grays. Houses (43); Triangular Construction Co. Houses (42), W. E. Walsham, Ltd., builders.

TIR-Y-BERTH.—Schools, for Glamorganshire E.C. (£16,000); the clerk, Cardiff.

TURRIFF.—Manse, for Parish Church (£2,917); Colonel G. B. Duff, Hatton Castle.

UDDINGSTON (LANARKSHIRE).—Institute, Jacks Road (£6,000), for the Lanarkshire Miners' Welfare Committee; the secretary, Glasgow.

WESTON-SUPER-MARE.—Housing scheme (200), for the U.D.C.; H. A. Brown, surveyor.

WILLENHALL.—Houses (58), for the U.D.C.; A. M. Griffiths, builder, Wednesfield.

WOKING.—Housing scheme (110), for the U.D.C.; surveyor.

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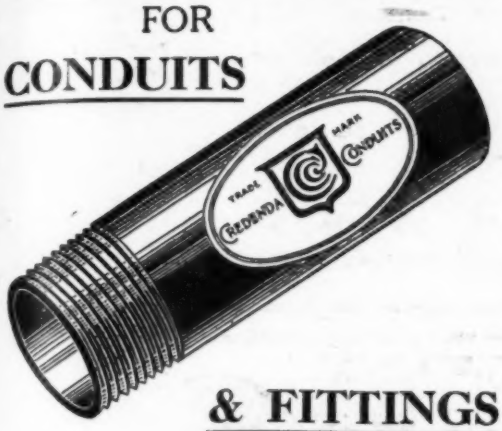

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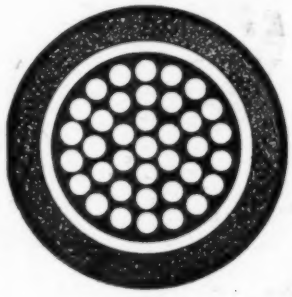

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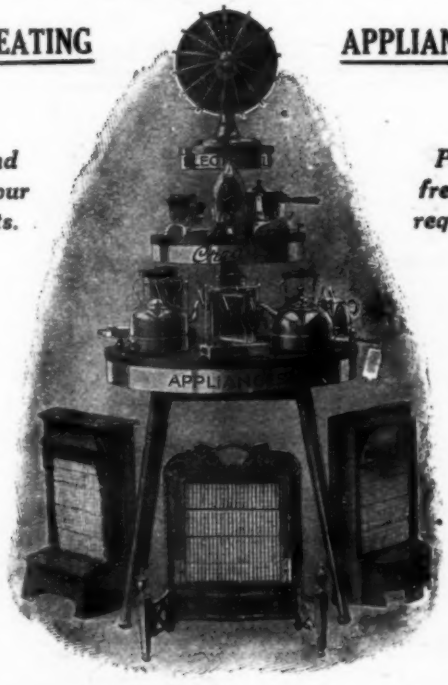

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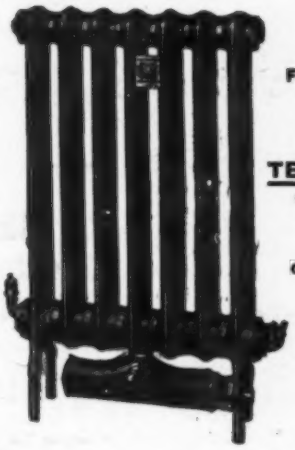

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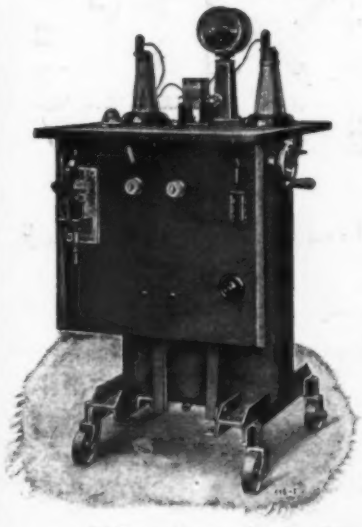

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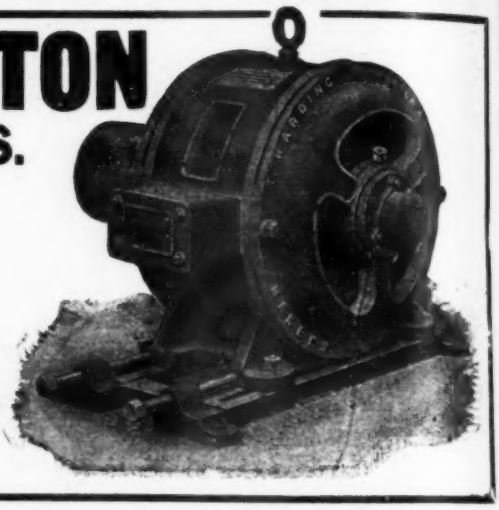

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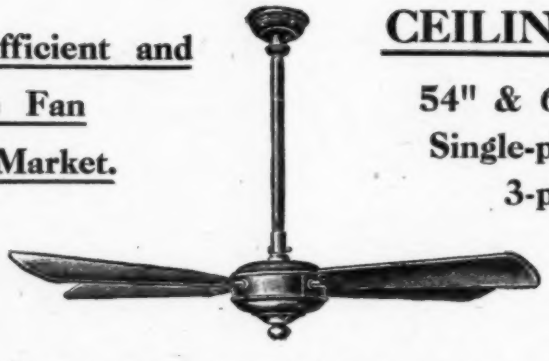

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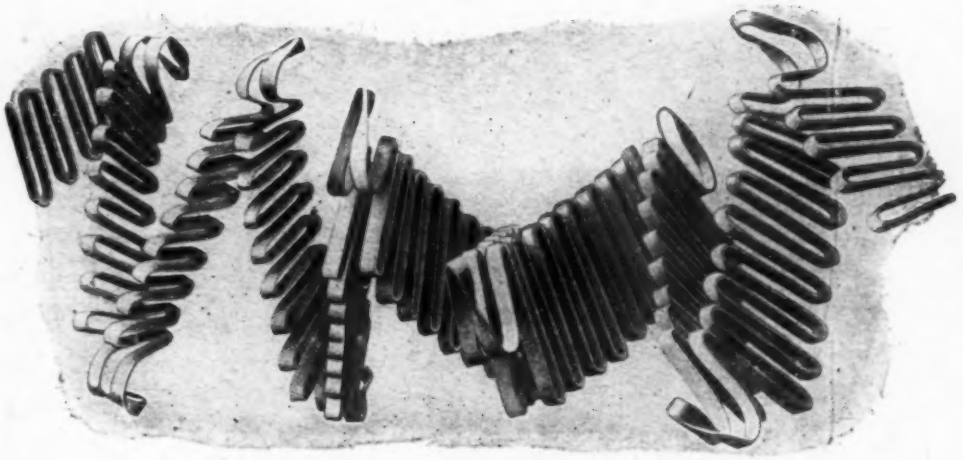

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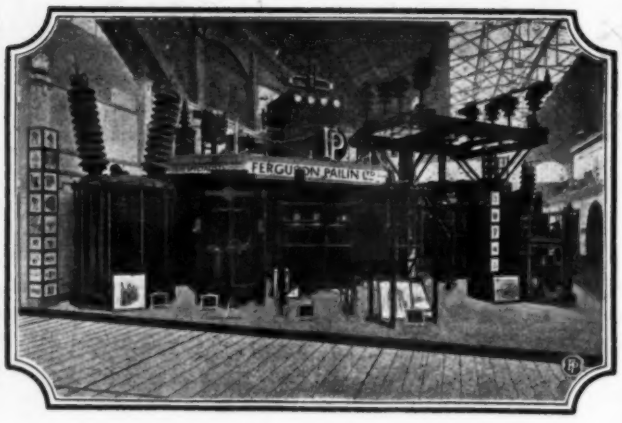

Testimonials.

TESTIMONIALS are often abused. Consequently we have been very doubtful about using those we publish on this page.

As, however, they are quite unsolicited, they bear the mark of spontaneity, and we have decided to publish them. They were occasioned by visits of the respective writers to our Stand at Wembley, which we illustrate above. They are, of course, only a few examples chosen at random from the many we have received.

No. 1 was written by an engineer trained in Germany and now practising in France.

No. 2 was written by the head of the Engineering Department of one of London's largest technical colleges.

No. 3 was from a well-known firm of Electrical Engineers.

No. 4 was sent by the Managing Director of an Electrical Manufacturing Company.

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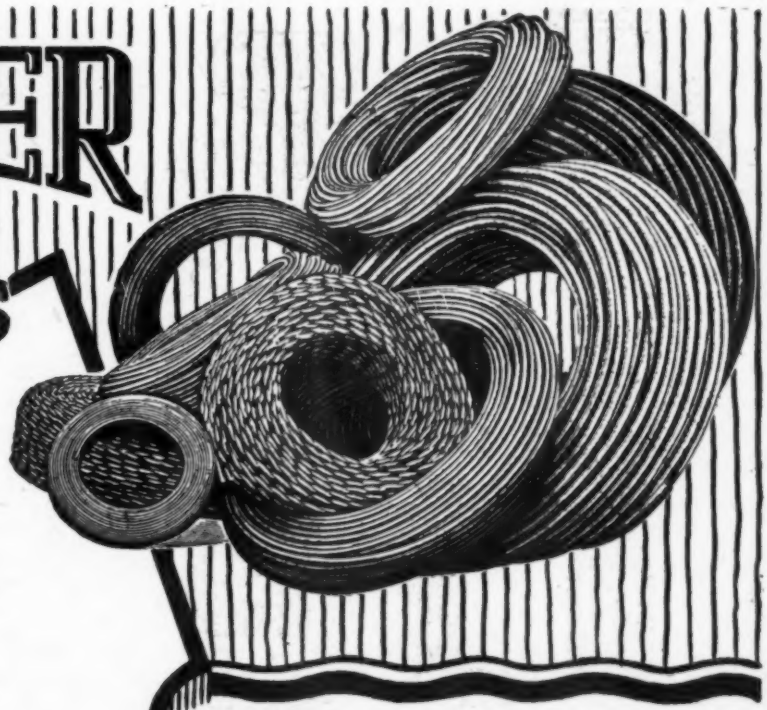

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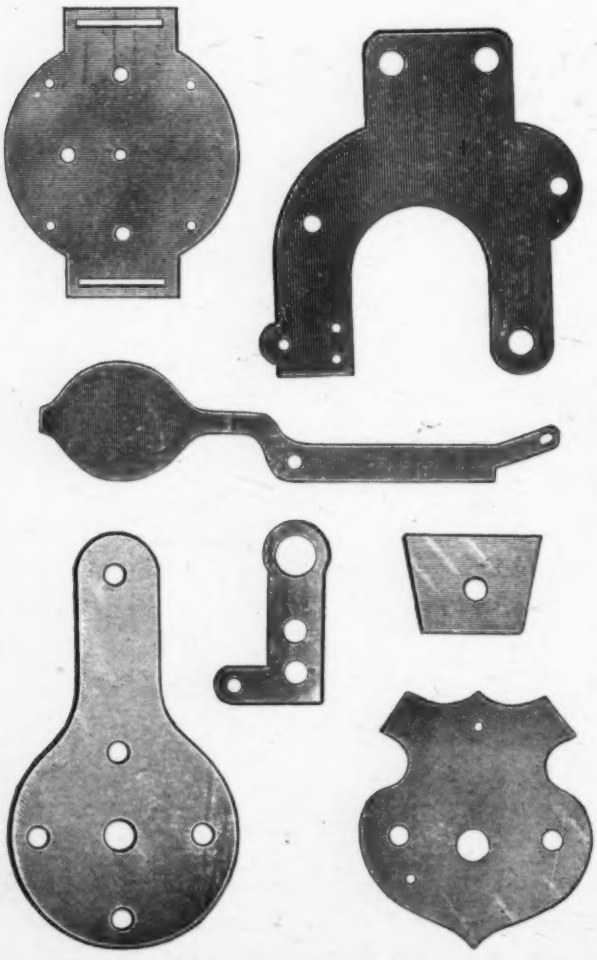

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„ 2a ...	21 × 16 ins. ...	33 × 17 ins.	
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„ 6 ...	42 × 24 ins. ...	61 × 38 ins.	74½ ins.
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„ 9 ...	36 × 36 ins. ...	42 × 33 ins.	
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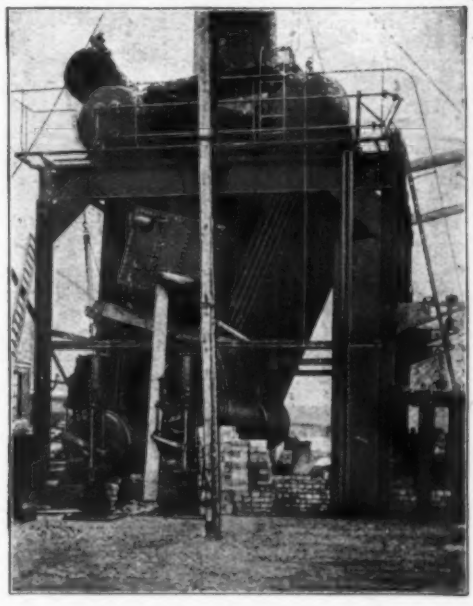

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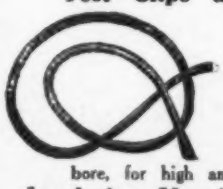

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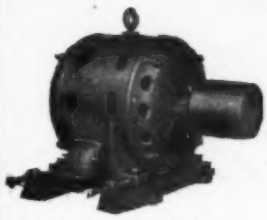

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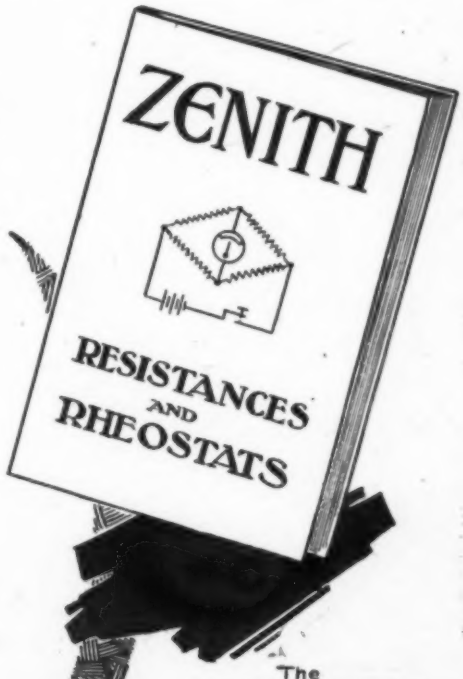

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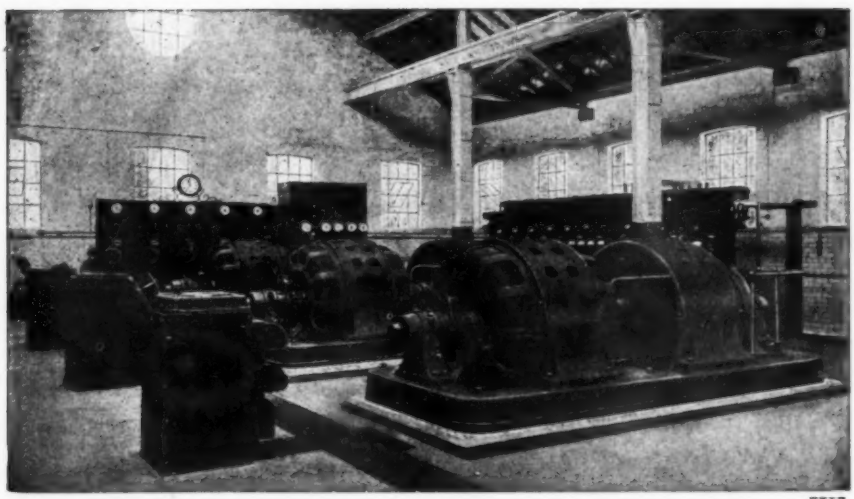

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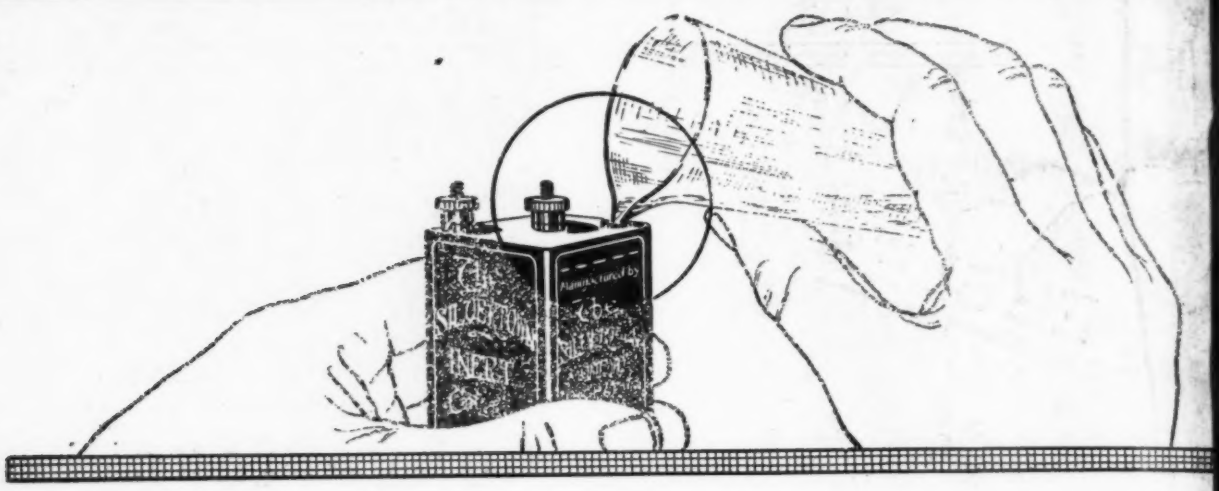

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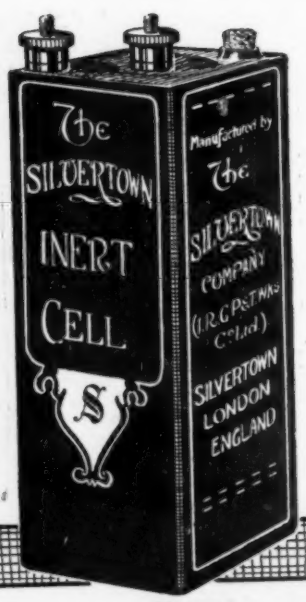

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